CIP

**User Manual &
Installation
Guide**

NT24k Switch Family

CIP – Common Industrial Protocol

N-TRON CIP Manual

1 Introduction

EtherNet/IP™, better known as the Common Industrial Protocol (CIP™), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of individual devices.

N-TRON switches with CIP support can be used to communicate with other industrial devices, such as Rockwell controllers.

2 CIP Components

The following CIP components are available with N-TRON CIP enabled switches.

2.1 Electronic Data Sheet (EDS)

An electronic datasheet for each N-TRON switch is provided.

In a Rockwell environment EDS files are installed using the "EDS Hardware Installation Tool". This allows N-TRON switches to be recognized in an RSLinx environment.

2.2 CIP Objects

"Objects" are used to organize various information about the switch. There are four types of objects provided. Three are specified by the ODVA, and one is N-TRON specific:

  ➢ Identity object
  ➢ TCP/IP Interface object
  ➢ Ethernet Link object
  ➢ N-TRON switch object

Standard "services" are associated with objects. Services exist for reading an attribute, setting an attribute, resetting a device, etc. See references [1] and [2] for specific details.

The following sections describe the attributes associated with each object type, such as attribute Id number and data format. All attributes can be read, but only some can be set, as shown by the "Set" column.

2.2.1 Identity Object

The identity object class (Class code = 0x01) and instance attributes are implemented as defined by CIP Vol 1, 5-2 [1].   There is one instance (1) of this object. Service code (0x32) will get all attributes, including optional attributes. The following table summarizes the attributes in the Identity object.

Id	Name	Set	Format	Description
1	Vendor ID		UINT (16)	1006. This is N-TRON's ODVA EtherNet/IP Vendor ID.
2	Device Type		UINT (16)	0x0C. Communications Adapter
3	Product Code		UINT (16)	Switch product code: NT24k = 24001 NT24k-DR16 = 24002 NT24k-DR24 = 24003
4	Major Revision		USINT (8)	Major version of CIP implementation.
	Minor Revision		USINT (8)	Minor version of CIP implementation.
5	Status		WORD (16)	Summary status of device. Bits: Bit 0 If set, device has an owner Bit 1 reserved Bit 2 If set, device has non-default configuration Bit 3 reserved Bits 4-7 Extended device status – not used Bit 8 Minor recoverable fault Bit 9 Minor unrecoverable fault Bit 10 Major recoverable fault Bit 11 Major unrecoverable fault Bits 12-15 reserved (see fault table below)
6	Serial Number		UDINT (32)	Serial number of the device. This is the last 4 octets of the base switch MAC.
7	Product Name		SHORT_STRING	Switch Model Number. EX: N-Tron NT24k
15	Assigned_Name	Set	STRINGI	This is the user assigned switch name.
17	Geographic_Location	Set	STRINGI	This is the user assigned switch location.

The table below defines fault bits within the Status attribute of the Identity object.

Bit	Called	Definition
8	Minor Recoverable Fault	Power supply 1, Power supply 2, N-Ring Full, System, Port utilization, Temperature, N-Link partner is down, N-Link integrity fault
9	Minor Unrecoverable Fault	Configuration device error
10	Major Recoverable Fault	N-Ring partial low, N-Ring partial high, N-Ring multiple managers, Boot loader version, N-Link partner port unknown, N-Link multiple masters, N-Link control fault, N-Link configuration fault, Settings fault
11	Major Unrecoverable Fault	none

2.2.2 TCP/IP Interface Object

The TCP/IP Interface object class (Class code = 0xF5) and instance attributes are implemented as defined by CIP Vol 2, 5-3 [2]. There is only one instance (1) of this object. The following table summarizes the attributes in the TCP/IP Interface object.

Id	Name	Set	Format	Description
1	Status		DWORD (32)	Interface status 0 interface configuration attrib not configured 1 interface configuration attrib is valid
2	Configuration Capability		DWORD (32)	Interface capability flags. Bits: 0 BOOTP client capable 1 DNS client capable 2 DHCP client capable 3 DHCP-DNS update capable 4 Configuration is settable 5 Through bit 31 reserved
3	Configuration Control	Set	DWORD (32)	Interface control flags. Bits 0-3: 0 use interface configuration previously stored 1 get interface configuration via BOOTP 2 get interface configuration via DHCP 3 through 15 reserved Bit 4=1 device shall resolve host names by querying a DNS server
4	Physical Link Object		STRUCT of:	
	Path Size		UINT (16)	Size of Path
	Path		Padded EPATH	Logical segments identifying the physical link object
5	Interface Configuration		STRUCT of:	
	IP Address	Set	UDINT (32)	The device's IP address.
	Network Mask	Set	UDINT (32)	The device's network mask
	Gateway Address	Set	UDINT (32)	Default gateway address
	Name Server	Set	UDINT (32)	Primary name server
	Name Server 2	Set	UDINT (32)	Secondary name server
	Domain Name	Set	STRING	Default domain name
6	Host Name		STRING	Host name

2.2.3 Ethernet Link Object

The Ethernet Link object class (Class code = 0xF6) and instance attributes are implemented as defined by CIP Vol 2, 5-4 [2].   There is one instance of this object per switch port where instance 1 = port 1, instance 2 = port 2, etc.   As per the CIP specification, the get all service code (0x01) will get all attributes, excluding vendor extensions. Service code (0x32) will get all attributes, including the N-TRON vendor extensions. The following table summarizes the attributes in the Ethernet Link object.

Id	Name	Set	Format	Description
1	Interface Speed		UDINT (32)	Interface speed currently in use. Speed in Mbps (e.g., 0, 10, 100, 1000, etc.)
2	Interface Flags		DWORD (32)	Interface status flags Bit map of interface flags. See section 5-4.3.2.1. Includes Link status, duplex mode, auto-negotiation status, etc.
3	Physical Address		ARRAY of 6 USINTs (8)	MAC address of switch port. Base MAC plus port number.
4	Interface Counters		STRUCT of:	
	In Octets		UDINT (32)	Octets received on the interface.
	In Ucast Packets		UDINT (32)	Unicast packets received on the interface.
	In Nucast Packets		UDINT (32)	Non-unicast packets received on the interface.
	In Discards		UDINT (32)	Inbound packets received on the interface but discarded
	In Errors		UDINT (32)	= 0. Not available. Inbound packets that contain errors (does not include In Discards).
	In Unknown Protos		UDINT (32)	= 0. Not available. Inbound packets with unknown protocol
	Out Octets		UDINT (32)	Octets sent on the interface
	Out Ucast Packets		UDINT (32)	Unicast packets sent on the interface
	Out Nucast Packets		UDINT (32)	Non-unicast packets sent on the interface
	Out Discards		UDINT (32)	Outbound packets discarded
	Out Errors		UDINT (32)	= 0. Not available. Outbound packets that contain errors
5	Media Counters		STRUCT of:	
	Alignment Errors		UDINT (32)	Frames received that are not an integral number of octets in length
	FCS Errors		UDINT (32)	Frames received that do not pass the FCS check
	Single Collisions		UDINT (32)	Successfully transmitted frames which experienced exactly one collision
	Multiple Collisions		UDINT (32)	Successfully transmitted frames which experienced more than one collision
	SQE Test Errors		UDINT (32)	= 0. Not available. Number of times SQE test error message is generated
	Deferred Transmissions		UDINT (32)	Frames for which first transmission attempt is delayed because the medium is busy
	Late Collisions		UDINT (32)	Number of times a collision is detected later than 512 bit times into the transmission of a packet
	Excessive Collisions		UDINT (32)	Frames for which transmission fails due to excessive collisions
	MAC Transmit Errors		UDINT (32)	= 0. Not available. Frames for which transmission fails due to an internal MAC sub layer transmit error

	Carrier Sense Errors		UDINT (32)	= 0. Not available. Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
	Frame Too Long		UDINT (32)	Frames received that exceed the maximum permitted frame size
	MAC Receive Errors		UDINT (32)	= 0. Not available. Frames for which reception on an interface fails due to an internal MAC sub layer receive error
6	Interface Control		STRUCT of:	
	Control Bits	Set	WORD (16)	Interface Control Bits. Includes auto-negotiation and duplex settings.
	Forced Interface Speed	Set	UINT (16)	Speed at which the interface shall be forced to operate. Speed in Mbps (10, 100, 1000, etc.)
7	Interface Type		USINT (8)	Type of interface: twisted pair, fiber, internal, etc.
8	Interface State		USINT (8)	Current state of the interface: operational, disabled, etc.
9	Admin State	Set	USINT (8)	Administrative state: enable, disable
10	Interface Label		SHORT_STRING	Human readable identification: TX1, FX1, GB1, A4, C8, etc.
100	Interface Description		SHORT_STRING	Human readable description. For example: Port 1 - 10/100 Mbit TX Port 15 - 100 MBit FX
101	Interface Utilization		USINT (8)	Percentage of entire interface bandwidth being used (0-100).
102	Utilization Alarm Upper Threshold	Set	USINT (8)	Upper percentage at which to declare utilization alarm (0-100).
103	Utilization Alarm Lower Threshold	Set	USINT (8)	Lower percentage at which to declare a utilization alarm (0-100).
104	Broadcast Limit	Set	USINT (8)	Broadcast limiting percentage (0-100). (BPCL)
105	TX Unicast Packet Rate		UDINT32	Number of TX unicast packets per second.
106	RX Unicast Packet Rate		UDINT32	Number of RX unicast packets per second.
107	TX Multicast Packet Rate		UDINT32	Number of TX multicast packets per second
108	RX Multicast Packet Rate		UDINT32	Number of RX multicast packets per second
109	TX Broadcast Packet Rate		UDINT32	Number of TX broadcast packets per second.
110	RX Broadcast Packet Rate		UDINT32	Number of RX broadcast packets per second.
111	TX Multicast Packets		UDINT32	Total number of TX multicast packets.
112	RX Multicast Packets		UDINT32	Total number of RX multicast packets.
113	TX Broadcast Packets		UDINT32	Total number of TX broadcast packets.
114	RX Broadcast Packets		UDINT32	Total number of RX broadcast packets.
115	Port Role		UDINT32	Bit mask of port roles. Bits= 0 = RSTP 1 = N-Ring 2 = N-Link Control 3 = N-Link Partner 4 = N-Link Coupler

2.2.4 N-TRON Object

The N-TRON object (Class code = 0xC0) is a vendor specific object and is implemented as defined by CIP Vol 1, 4 [1]. There is only one instance (1) of this object. The following table summarizes the attributes of the N-TRON object.

Id	Name	Set	Format	Description
1	Device Up Time		UDINT (32)	Number of seconds since device was powered up.
2	Port Count		UDINT (32)	Total port count
3	Valid Ports		LWORD (64) AB: DINT[2]	0 = Invalid Port, 1 = Port Exists on device Bit 0: Port 1 Bit 1: Port 2 etc.
4	Global Admin Status		LWORD (64) AB: DINT[2]	0 = Port Disabled, 1 = Port Enabled Bit 0: Port 1 Bit 1: Port 2 etc.
5	Global Link Status		LWORD (64) AB: DINT[2]	0 = Link Down, 1 = Link Up Bit 0: Port 1 Bit 1: Port 2 etc.
6	System Faults		DWORD (32)	Bit 00: Power Supply 1 Bit 01: Power Supply 2 Bit 02: N-Ring Fault (complete) Bit 03: N-Ring Partial Fault (low port) Bit 04: N-Ring Partial Fault (high port) Bit 05: N-Ring Multiple Managers Bit 06: System error Bit 07: the configuration on an installed configuration device is invalid Bit 08: N-Link Fault Bit 09: Boot loader version mismatch Bit 10: Port Utilization Alarm Bit 11: Temperature Alarm Bit 12: Settings fault
7	IGMP Querier Status		USINT (8)	Query Status: 0 = Disabled, 1 = Active (manual), 2 = Active (Auto), 3 = Backup (Auto) [enabled but not active].
8	IGMP Version		USINT (8)	IGMP Version (V1, V2, V3, etc.).
9	IGMP Resource Usage		USINT (8)	Percent of maximum capacity. Takes into account the number of groups used per max groups and any other possible resource limitations (0-100).
10	IGMP Active Querier		UDINT (32)	IP of the active IGMP querier.
11	CPU Usage		USINT (8)	Percent of usage (0-100).
12	Class 1 Connections		UINT (16)	Number of CIP EtherNet/IP class 1 (multicast) connections.
13	Class 3		UINT (16)	Number of CIP EtherNet/IP class 3 (unicast)

	Connections			connections.
14	Temperature Alarm Upper Threshold	Set	INT (16)	Upper temperature (C) at which to declare an alarm
15	Temperature Alarm Lower Threshold	Set	INT (16)	Lower temperature (C) at which to declare an alarm
16	Contact Status		BYTE (8)	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
17	Temperature_C		INT (16)	Temperature in degrees C. 0x7FFF = Not Supported on device.
18	Temperature_F		INT (16)	Temperature in degrees F. 0x7FFF = Not Supported on device.
19	Reset MIB Counts	Set	LWORD (64)	Reset port MIB counters. (1 bit per port to reset).
20	Device MAC Address		ARRAY of 6 USINTs (8)	MAC address of device
21	Device Role		UDINT (32)	Bit mask of device roles. Bits= 0 = N-Ring Manager 1 = N-Ring Member 2 = N-Ring AutoDetect 3 = N-Link Master 4 = N-Link Slave 5 = N-Link Coupler
22	Config Device Status		BYTE (8)	0 = Not Supported, 1 = Not Present, 2 = Present
23	System Configuration	Set	UDINT (32)	Bit mask of system config. Bits= Bit 0: GET: Changes have been made that have not been saved. SET: Save system configuration to flash. Bit 1: GET: Changes have been made that require a reboot to take effect. SET: Shutdown and reboot device
24	System Firmware Version String		SHORT_STRING	Human readable representation of firmware version string.
25	System Boot Loader Version String		SHORT_STRING	Human readable representation of boot loader version string.
26	System Fault String		STRINGI	Human readable representation of error status. May contain multiple errors. Length is contained as part of the STRINGI data type.
27	Power Configuration		UDINT (32)	4 Bits per power supply. 0000 = DC Power, 0001 = AC Power, 1111 = Unknown. Power supply 1 configuration is in bits 0-3 and Power supply 2 configuration is in bits 4-7.

2.3 CIP Services

The table following is a summary of the supported services as defined by CIP Vol 1, Appendix A: Explicit Messaging Services [1].

Service Code	Service Description	Identity	TCP/IP	Ethernet Link	N-TRON
1	Get_Attributes_All	yes	yes	yes	yes
5	Reset	Yes – reset switch or restore factory configuration			
14	Get_Attribute_Single	yes	yes	yes	yes
16	Set_Attribute_Single	Attributes 15,17	Attributes 3,5	Attributes 6,9, 102-104	Attributes 14,15,19,23
Vendor Specific					
50	Get_All_Attributes – including vendor defined attributes	yes		yes	
Object Specific					
76	Get_And_Clear			Attributes 4,5	

2.4 Accessing Data

2.4.1 Explicit Messaging

Explicit messaging refers to a request/response form of communications over a CIP (TCP/IP) connection. Applications can use explicit messaging, for example, to invoke the "Get All Attributes" service and read all attributes of the Identity object.

2.4.2 I/O Connections

I/O connections are used to send data (grouped in assemblies) between devices periodically. The interval between sends is the "Requested Packet Interval", or RPI.

The N-TRON switch assemblies (Input, Output, and Configuration) are defined in the following table.

N-TRON switch	Assembly Number	Size (bytes)
Input (to switch)*	101	4
Output (from switch)	102	104
Configuration*	103	0

* - not currently used

In an RSLogix 5000 environment, these assemblies are configured in the "Connection Parameters" panel of the Generic Ethernet Module. (Note that input and output assemblies are reversed.) More information is contained in the section for Add-On Instruction installation.

3 Rockwell RSLogix 5000 – Add-On Instruction Installation

N-TRON Switch
RSLogix Add-On Instructions (AOI)

Installation Instructions

Software installation prerequisites
1. RSLogix 5000 version 17 or later
2. N-TRON switch with firmware version that includes CIP support

Summary of steps
1. Import the Add-On Instruction (AOI)
2. Add your N-TRON switch to the I/O Configuration tree
3. Add an instance of the AOI in your application
4. Create and configure tags for the AOI

3.1 Configuration of RSLogix project

Extract all files from the zip file to your desktop or destination folder.

Open an RSLogix project.

Import the N-TRON Add-On Instruction (AOI). In the controller organizer window, right click "Add-On Instructions" folder, select "Import Add-On Instruction" and browse to the folder containing AOI_NTRON_*.L5X files. Import an AOI for each switch type installed.

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.the-red-lion.net - Email: info@the-red-lion.net
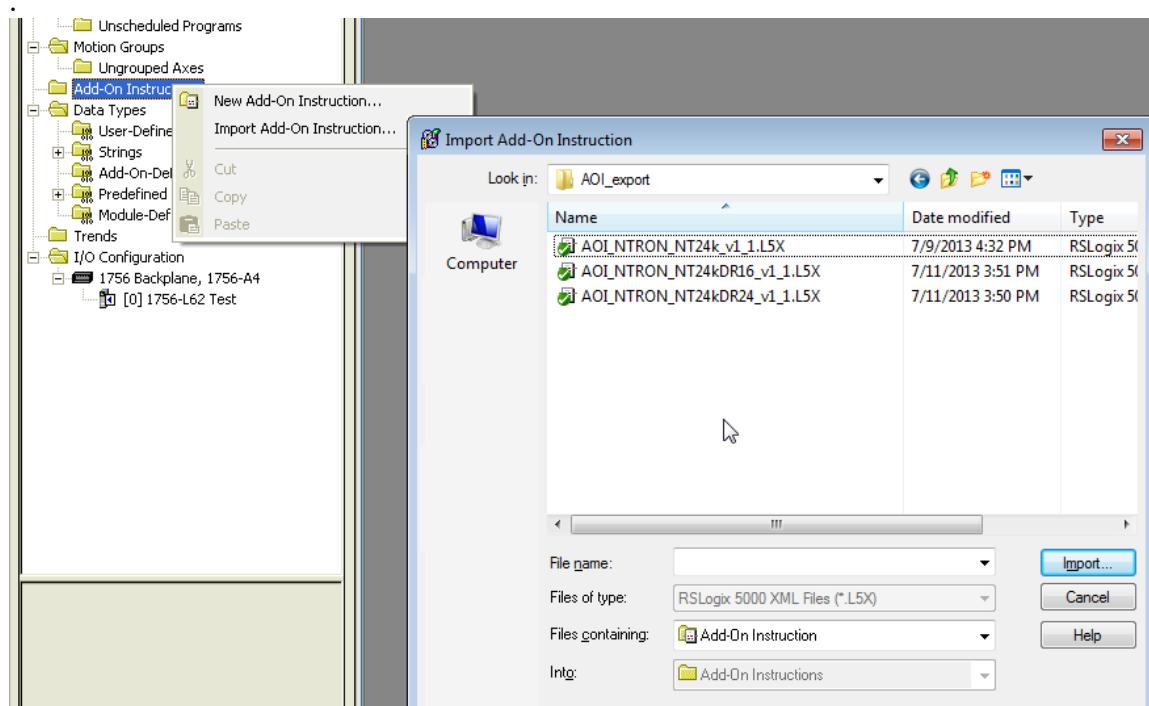
The Add-On Instruction tree showing an AOI for the NT24k switch, and several auxiliary AOIs.
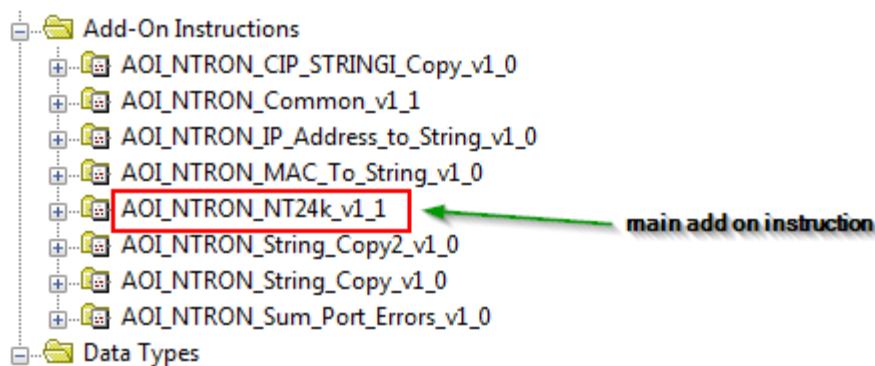
Add a Generic Ethernet Module to the I/O Configuration.
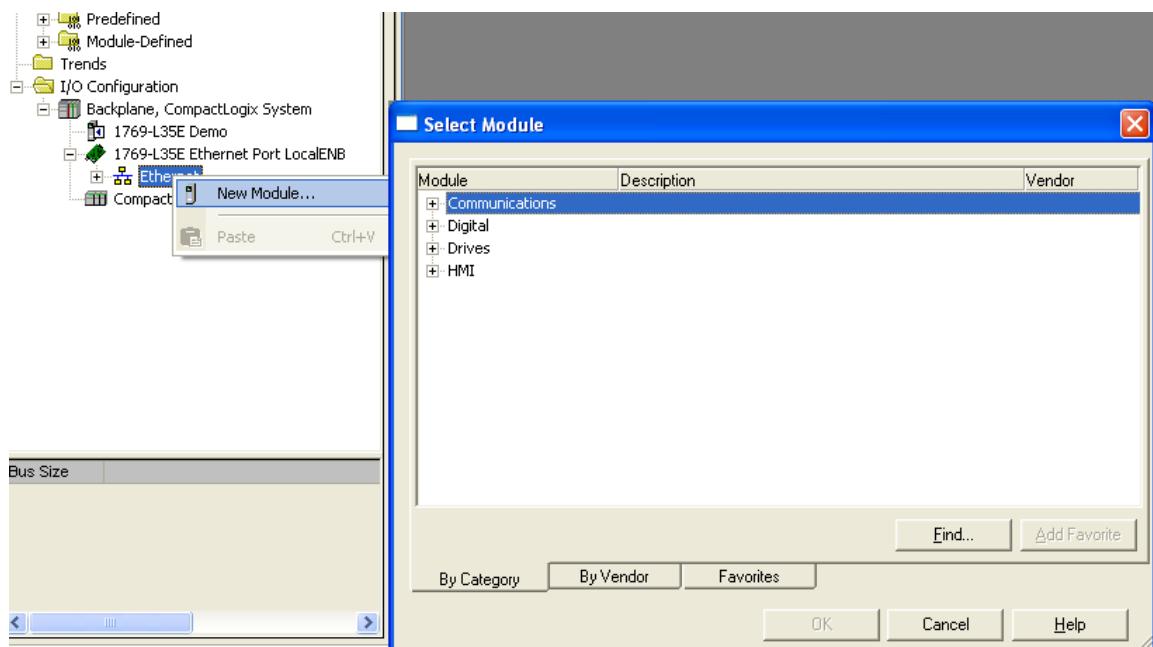
The Generic Ethernet Module is located under the "Communications" group:
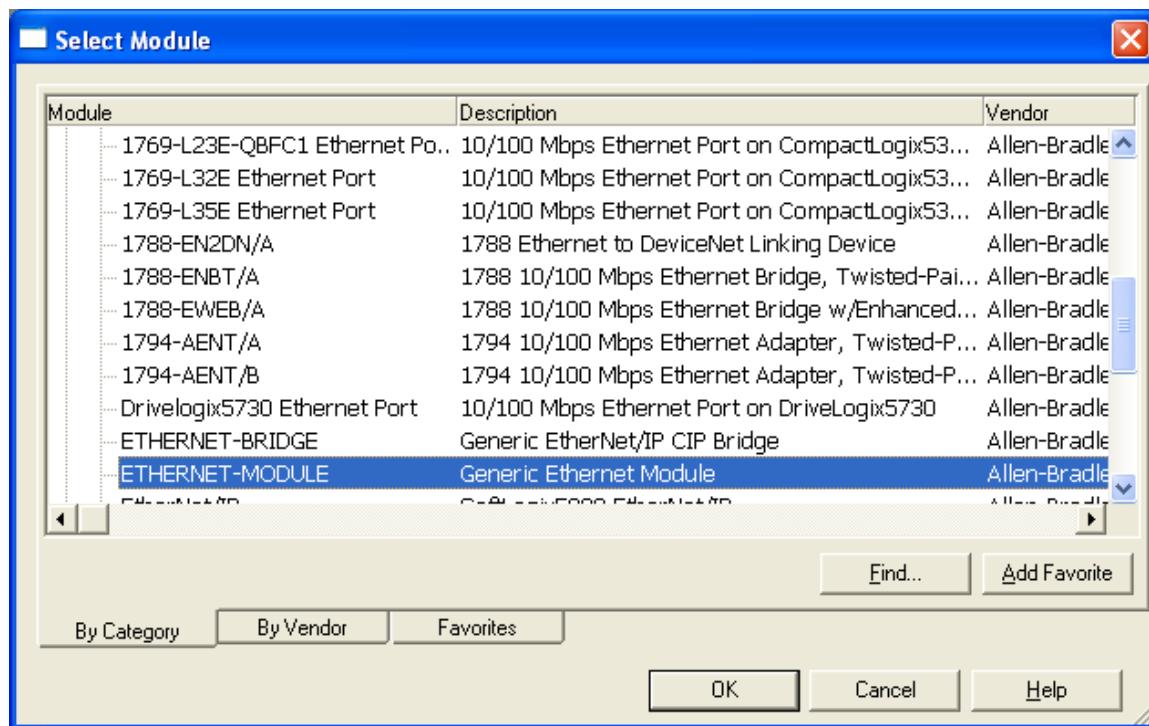
Configure the module as shown. Use the proper IP address and connection parameters for your installation.
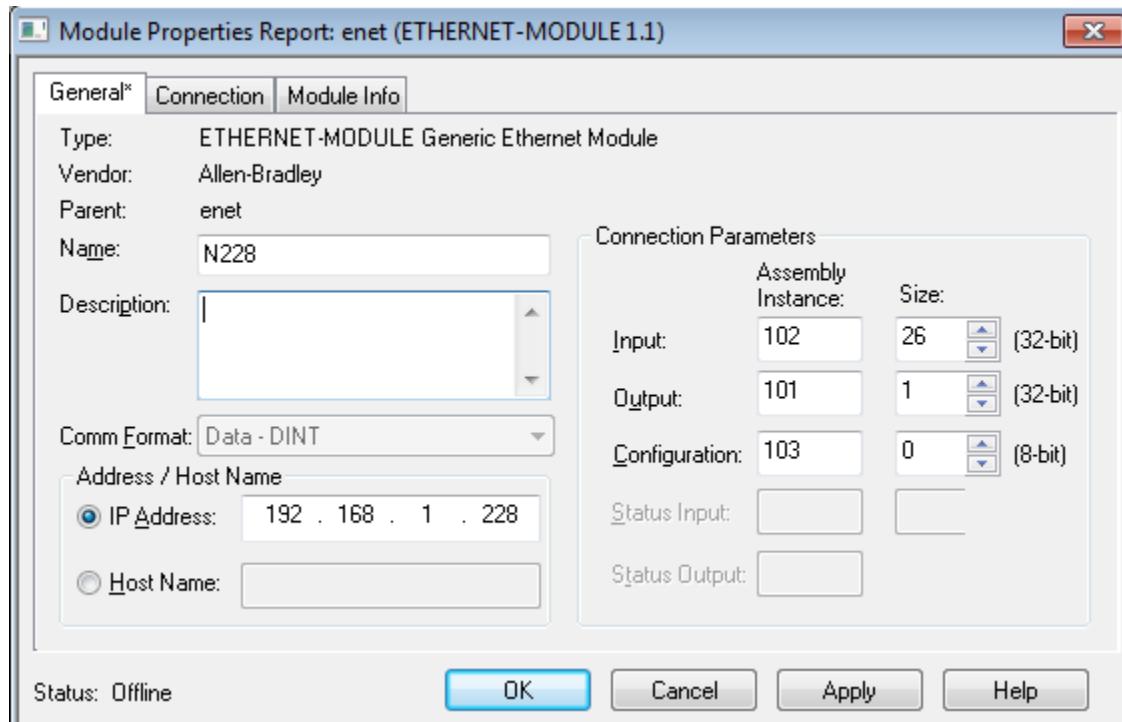
Click the Connection tab and set the desired RPI. The input assembly will be received from the switch at the selected RPI.
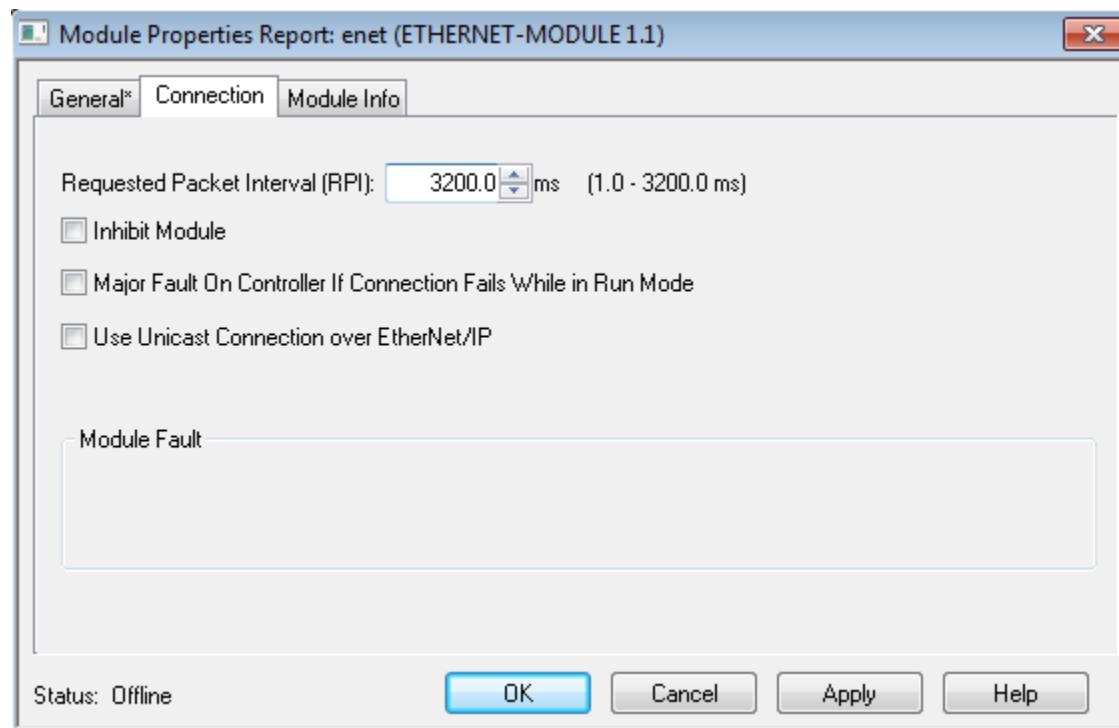
Click OK. The new module will appear in the I/O Configuration tree:
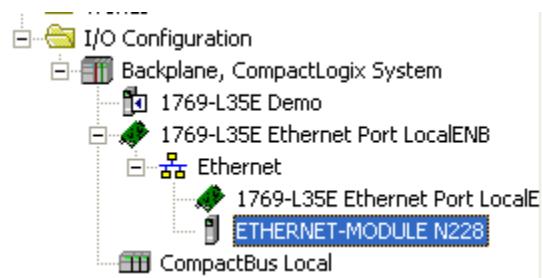
Create a new rung in the MainRoutine and add the AOI for your specific switch to the rung.
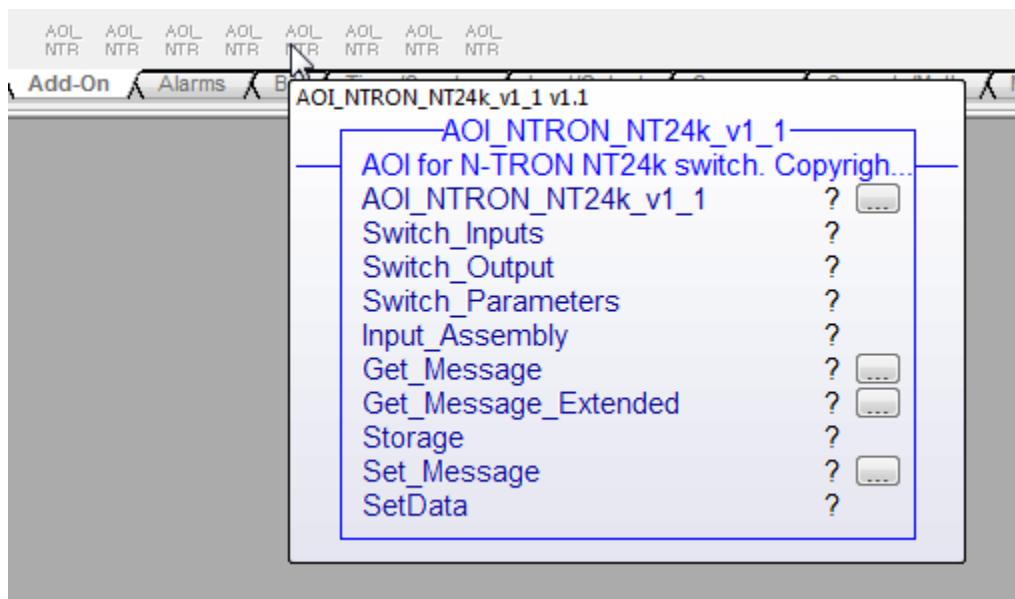
The following will appear:

Add tag names for the various fields. For example:
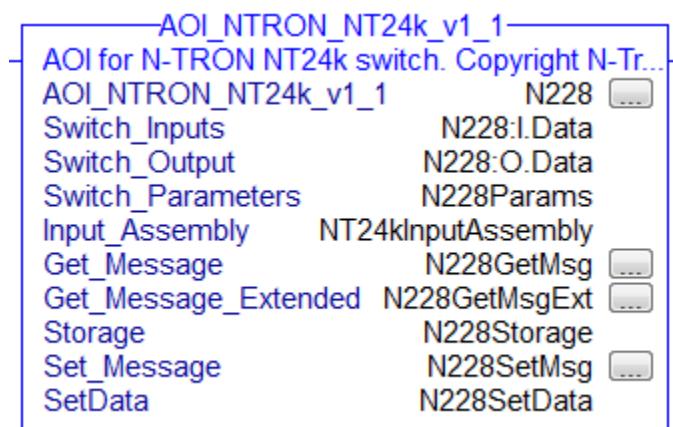
Right click on each new tag name and create each tag. (Note that the tags for Switch_Inputs and Switch_Outputs, shown in the rectangle above, were created when the Generic Ethernet Module was added.)

For example:
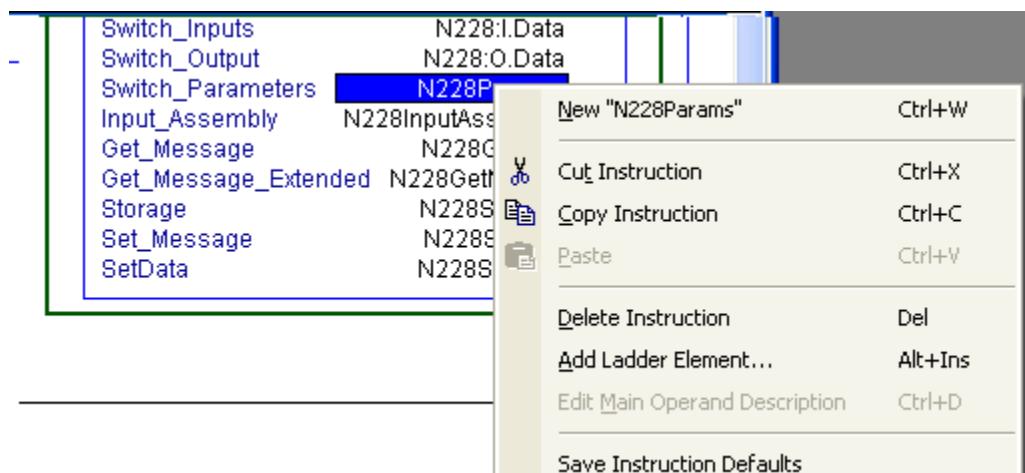
Click the button to the right of the "Get_Message" tag and configure as shown:

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.the-red-lion.net - Email: info@the-red-lion.net
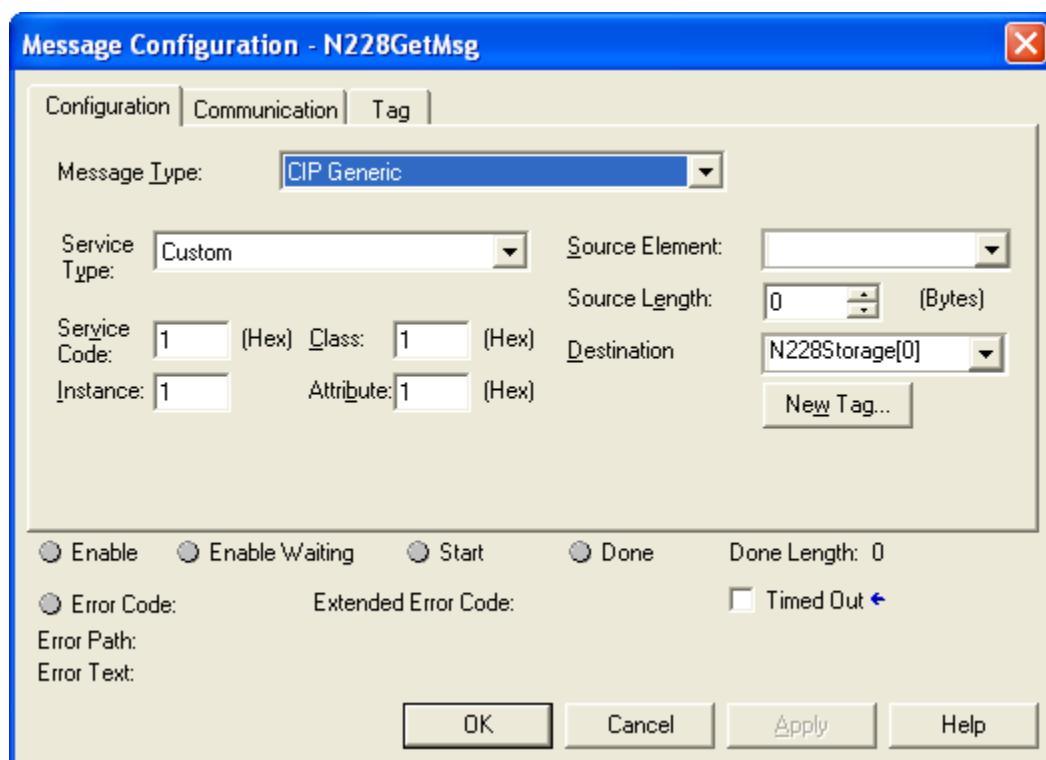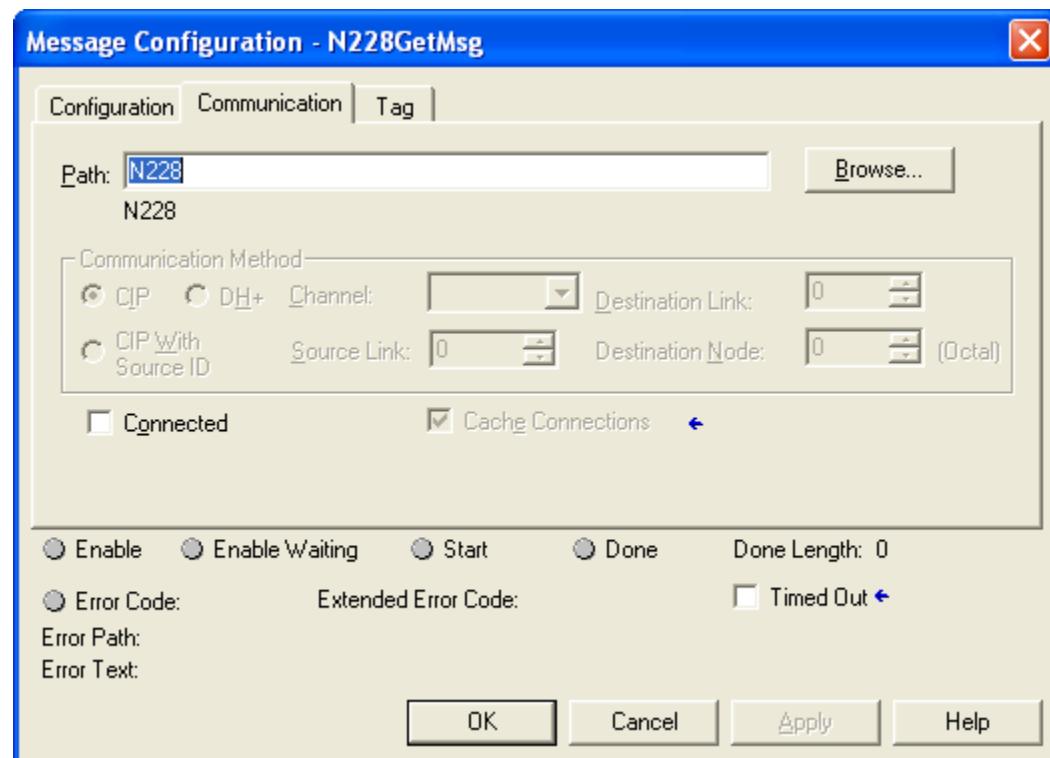
Click the button to the right of the "Get_Message_Extended" tag and configure as shown:
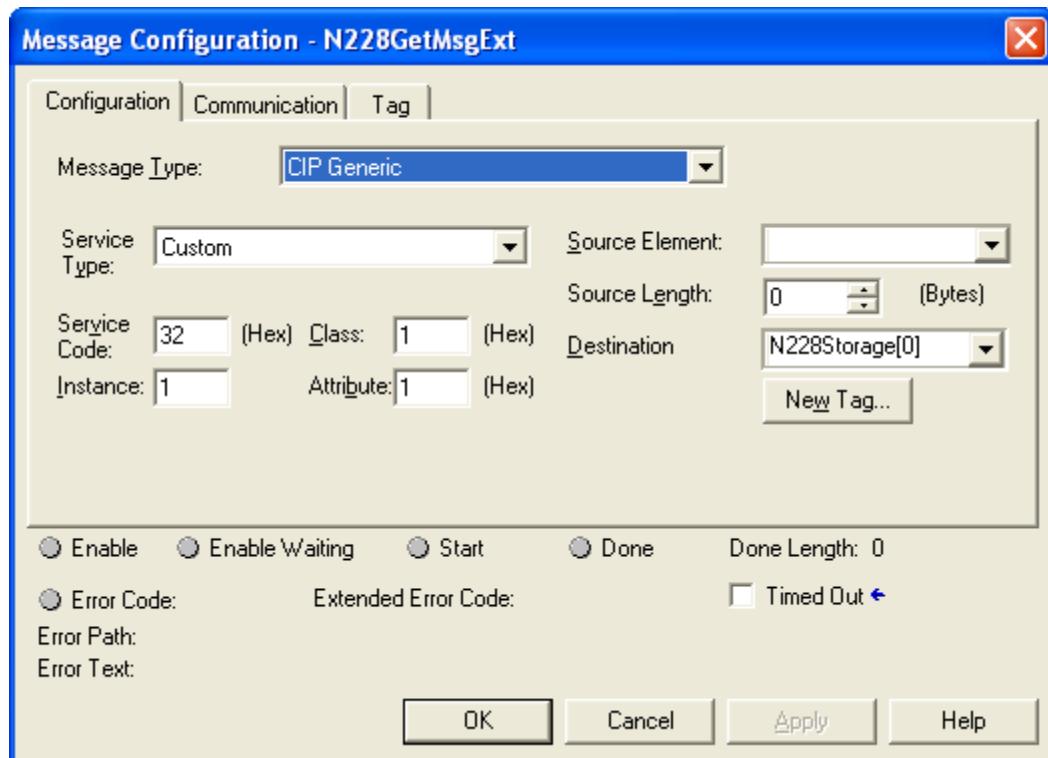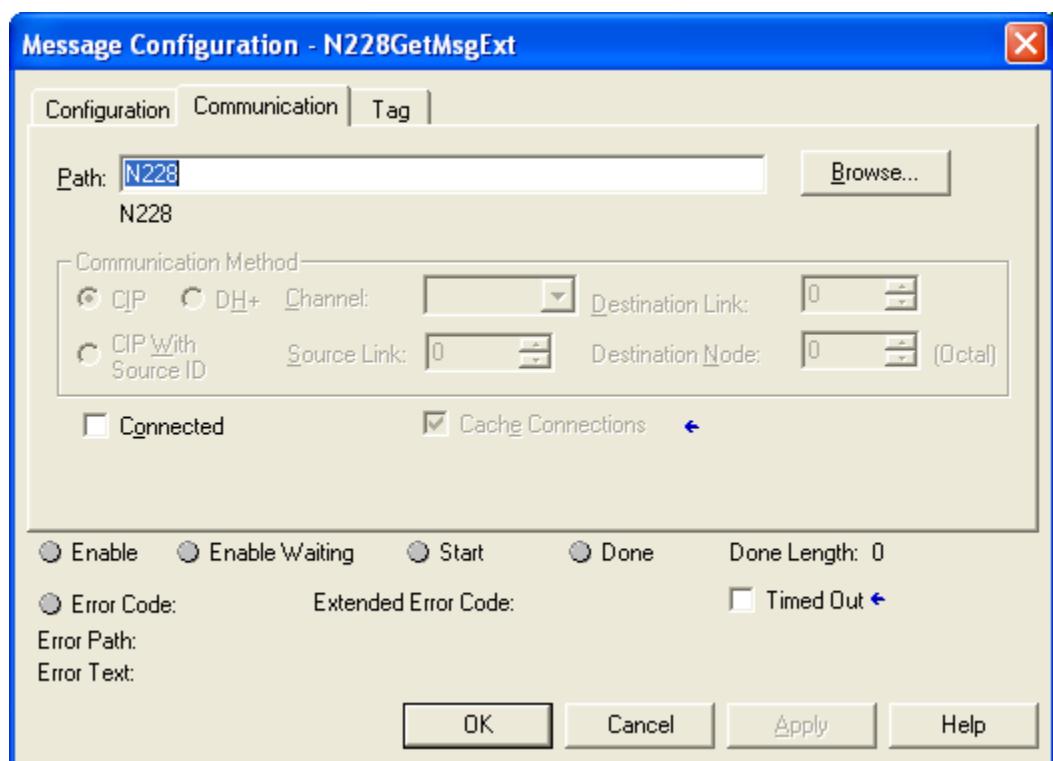
Click the button to the right of the "Set_Message" tag and configure as shown:
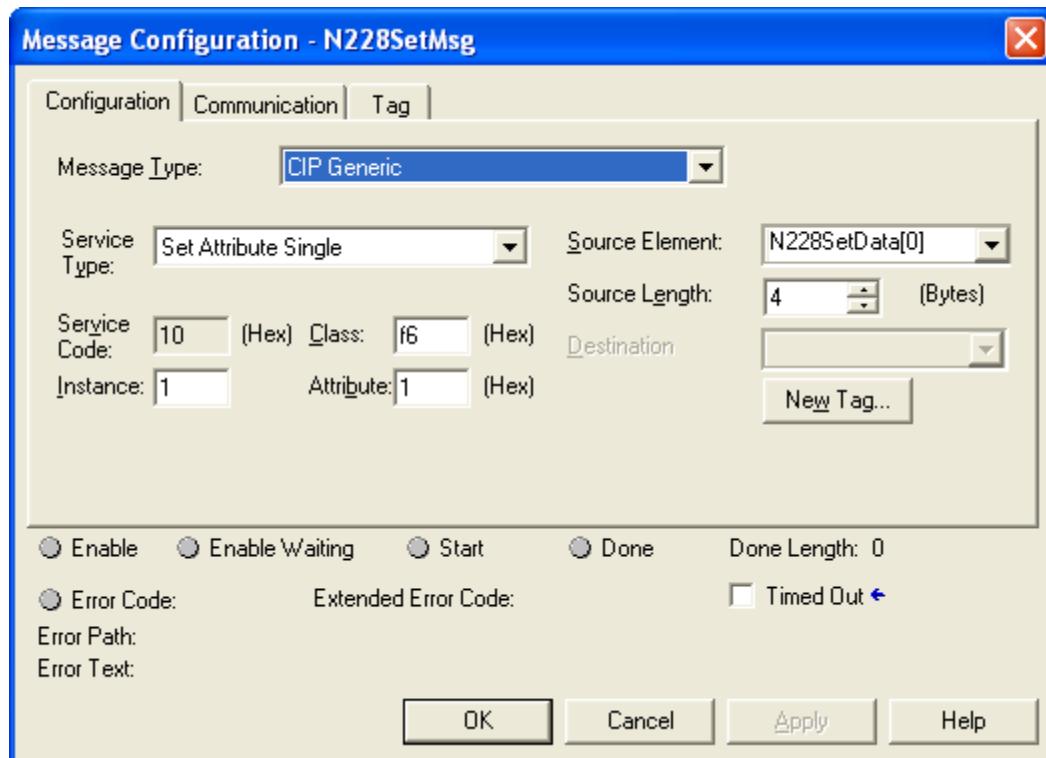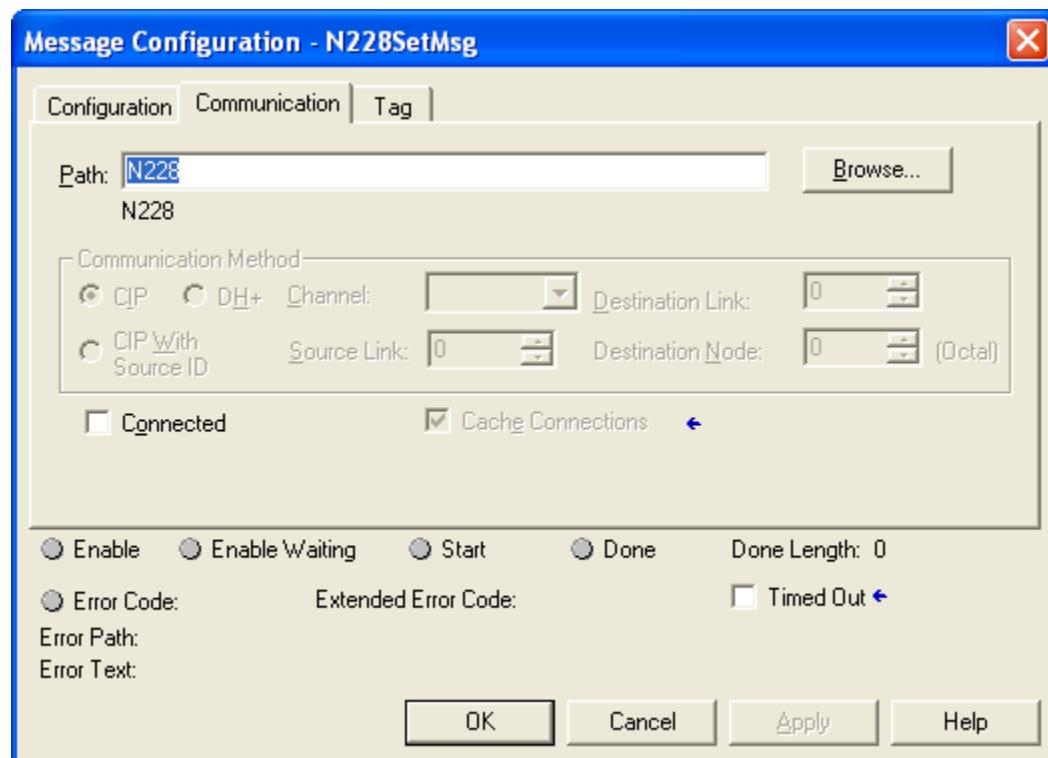
Verify your changes by clicking Logic > Verify > Controller. If there are no warnings or errors, the RSLogix configuration is complete.

3.2 Input_Assembly Parameter

Some data comes from the switch at the RPI (requested packet interval) set for the Generic Ethernet Module. The data is available in tags like these below (a mapping of the Switch_Inputs data):

```
─ NT24kInputAssembly
    + NT24kInputAssembly.System_Faults
    + NT24kInputAssembly.Admin_Status
    ─ NT24kInputAssembly.Admin_Status_A1
    ─ NT24kInputAssembly.Admin_Status_A2
    ─ NT24kInputAssembly.Admin_Status_A3
    ─ NT24kInputAssembly.Admin_Status_A4
    ─ NT24kInputAssembly.Admin_Status_A5
    ─ NT24kInputAssembly.Admin_Status_A6
    ─ NT24kInputAssembly.Admin_Status_A7
    ─ NT24kInputAssembly.Admin_Status_A8
    ─ NT24kInputAssembly.Admin_Status_B1
    ─ NT24kInputAssembly.Admin_Status_B2
    ─ NT24kInputAssembly.Admin_Status_B3
    ─ NT24kInputAssembly.Admin_Status_B4
    ─ NT24kInputAssembly.Admin_Status_B5
    ─ NT24kInputAssembly.Admin_Status_B6
    ─ NT24kInputAssembly.Admin_Status_B7
    ─ NT24kInputAssembly.Admin_Status_B8
    ─ NT24kInputAssembly.Admin_Status_C1
    ─ NT24kInputAssembly.Admin_Status_C2
    ─ NT24kInputAssembly.Admin_Status_C3
    ─ NT24kInputAssembly.Admin_Status_C4
    ─ NT24kInputAssembly.Admin_Status_C5
    ─ NT24kInputAssembly.Admin_Status_C6
    ─ NT24kInputAssembly.Admin_Status_C7
    ─ NT24kInputAssembly.Admin_Status_C8
    + NT24kInputAssembly.Link_Status
    ─ NT24kInputAssembly.Link_Status_A1
    ─ NT24kInputAssembly.Link_Status_A2
    ─ NT24kInputAssembly.Link_Status_A3
    ─ NT24kInputAssembly.Link_Status_A4
    ─ NT24kInputAssembly.Link_Status_A5
```

These tags represent a switch specific (NT24k) view of the assembly data.

3.3 Switch_Parameters Parameter

The AOI requests additional information from the switch as needed by a faceplate display (and when started). This includes the CIP Identity object, the CIP TCP/IP object, an instance of the CIP Ethernet Link object, and the NTRON Switch object.

The RSLogix 5000 screenshot below shows a top level view of some of the AOI "Switch_Parameters" structure:

⊟ N228params	UDT_NTRON_Switch_Common_v0	
⊞ N228params.Generic_Inputs	UDT_NTRON_Switch_In_v0	assembly received from switch
⊞ N228params.Output	DINT	assembly sent to switch
⊞ N228params.Identity	UDT_NTRON_CIP_Identity_v0	N-TRON CIP Identity Object
⊞ N228params.TCPIP	UDT_NTRON_CIP_TCPIP_Interface_v0	N-TRON CIP TCP/IP Interface Object
⊞ N228params.Switch	UDT_NTRON_CIP_Switch_v0	N-TRON CIP Custom Object
⊞ N228params.Ethernet_Link	UDT_NTRON_CIP_Ethernet_Link_v0[64]	N-TRON CIP Ethernet Link Object
⊞ N228params.Data	UDT_NTRON_CIP_DATA_v0	Related to HMI data and control
⊞ N228params.Control	UDT_NTRON_CIP_Control_v0	Created to control explicit CIP messaging

N228Params.Generic_Inputs is a generic view of the assembly data from a switch.

3.4 Explicit Messaging Options

To direct the AOI to gather this information (via explicit messaging) for other purposes (example: not using faceplates), use the following members of the N228Params.Control tag:

Name	Data Type	Description
Selected_Port	INT	Use this member to read Ethernet Link object for one port. To read more than one port, use Read_Port_Mask. Set by the faceplate. Port data is copied to the UDT_NTRON_CIP_DATA_v0 data type.
Request_Data	BOOL	0 - explicit messaging is disabled; 1 - explicit messaging is enabled
Read_Port_Mask	DINT	Set bit n to read Ethernet Link object for port n+1
Explicit_Messaging_Timer _Reset	DINT	Used to control time between each MSG call to read CIP Identity object, TCPIP object, N-TRON object, and selected Ethernet Link objects. Minimum is 200 ms. Default is 1000 ms.

Sample ladder logic rungs are available that show how to control explicit messaging.

3.5 Troubleshooting

Module Fault (Code 16#0315 Connection Request Error: Invalid segment type.

This error occurs when the assembly information specified for the Generic Ethernet Module does not match the assembly information on the N-TRON switch.

3.6 Sample Project

A sample project is included in the CIP Installation Kit. It is named
NTRON_Demo.ACD.

To use the sample project, you may need to change the controller type used in your
environment, and you will need to setup the Project path.

If you have any suggestions for improving the AOI or the installation instructions, please
send them to email with subject "RSLogix5000 AOI".

4 Rockwell RSLogix 5000 – Tag reference

The assembly data received from an N-TRON switch can be viewed with generic tags or switch specific tags. Generic tags are defined by the data type UDT_NTRON_Switch_In_NT24k_v0. Switch specific tags are defined by a switch specific data type.

Switch	Data Type
NT24k	UDT_NTRON_Switch_NT24k_In_v1
NT24k-DR16	UDT_NTRON_Switch_ NT24k DR16_In_v1
NT24k-DR24	UDT_NTRON_Switch_ NT24k DR24_In_v1

Here are some of the tag descriptions:

4.1 Generic assembly tags

Data Type: UDT_NTRON_Switch_In_NT24k_v0

Generic view of assembly data received from an N-TRON Switch.

Name	Data Type	Description
System_Faults	UDT_NTRON_System_Faults_NT24k_v0	Status of various system faults.
Admin_Status	DINT	Admin Status of first 32 ports. Also available as port specific tags.
Admin_Status_1		
Admin_Status_2		
Admin_Status_3		
…	BOOL	1=enabled, 0=disabled
Admin_Status_30		
Admin_Status_31		
Admin_Status_32		
Admin_Status2	DINT	Admin Status of second 32 ports. Also available as port specific tags.
Admin_Status_33		
Admin_Status_34		
Admin_Status_35	BOOL	1=enabled, 0=disabled
…		

Admin_Status_62		
Admin_Status_63		
Admin_Status_64		
Link_Status	DINT	Link Status of first 32 ports. Also available as port specific tags.
Link_Status_1		
Link_Status_2		
Link_Status_3		
…	BOOL	1=active, 0=inactive
Link_Status_30		
Link_Status_31		
Link_Status_32		
Link_Status2	DINT	Link Status of second 32 ports. Also available as port specific tags.
Link_Status_33		
Link_Status_34		
Link_Status_35		
…	BOOL	1=active, 0=inactive
Link_Status_62		
Link_Status_63		
Link_Status_64		
Utilization_Alarm	DINT	Bandwidth utilization alarms for first 32 ports. Also available as port specific tags.
Utilization_Alarm_1		
Utilization_Alarm_2		
Utilization_Alarm_3		
…	BOOL	1=bandwidth utilization exceeds a high or low limit, 0=bandwidth utilization within limits
Utilization_Alarm_30		
Utilization_Alarm_31		
Utilization_Alarm_32		
Utilization_Alarm2	DINT	Bandwidth utilization alarms for second 32 ports. Also available as port specific tags.
Utilization_Alarm_33		1=bandwidth utilization exceeds a high or low limit, 0=bandwidth utilization within limits
Utilization_Alarm_34	BOOL	

Utilization_Alarm_35		
…		
Utilization_Alarm_62		
Utilization_Alarm_63		
Utilization_Alarm_64		
Class1_Connections	INT	Number of CIP EtherNet/IP class 1 (multicast) connections
Class3_Connections	INT	Number of CIP EtherNet/IP class 3 (unicast) connections
Temperature_C	INT	Temperature in degrees Celsius. 0x7FFF = Not supported on device.
Temperature_F	INT	Temperature in degrees Fahrenheit. 0x7FFF = Not supported on device.
CPU_Utilization	SINT	Percent of CPU usage, 0-100
Contact_Status	SINT	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
Utilization_1		
Utilization_2		
Utilization_3		
…	SINT	bandwidth utilization in percent
Utilization_62		
Utilization_63		
Utilization_64		
Update_Counter	INT	

4.2 NT24k assembly tags

Data Type: UDT_NTRON_Switch_NT24k_In_v0

Specific view of assembly data received from an N-TRON NT24k Switch.

Name	Data Type	Description
System_Faults	UDT_NTRON _System_Fault s_NT24k_v0	Status of various system faults.
Admin_Status	DINT	Admin Status of first 32 ports. Also available as port specific tags.
Admin_Status_A1 …	BOOL	1=enabled, 0=disabled

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Admin_Status_A8		
Admin_Status_B1		
…		
Admin_Status_B8		
Admin_Status_C1		
…		
Admin_Status_C8		
Link_Status	DINT	Link Status of first 32 ports. Also available as port specific tags.
Link_Status_A1		
…		
Link_Status_A8		
Link_Status_B1		
…	BOOL	1=active, 0=inactive
Link_Status_B8		
Link_Status_C1		
…		
Link_Status_C8		
Utilization_Alarm	DINT	Bandwidth utilization alarms for first 32 ports. Also available as port specific tags.
Utilization_Alarm_A1		
…		
Utilization_Alarm_A8		
Utilization_Alarm_B1		
…	BOOL	1=bandwidth utilization exceeds a high or low limit, 0=bandwidth utilization within limits
Utilization_Alarm_B8		
Utilization_Alarm_C1		
…		
Utilization_Alarm_C8		
Class1_Connections	INT	Number of CIP EtherNet/IP class 1 (multicast) connections
Class3_Connections	INT	Number of CIP EtherNet/IP class 3 (unicast) connections
Temperature_C	INT	Temperature in degrees Celsius. 0x7FFF =

		Not supported on device.
Temperature_F	INT	Temperature in degrees Fahrenheit. 0x7FFF = Not supported on device.
CPU_Utilization	SINT	Percent of CPU usage, 0-100
Contact_Status	SINT	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
Utilization_A1	SINT	bandwidth utilization in percent
…		
Utilization_A8		
Utilization_B1		
…		
Utilization_B8		
Utilization_C1		
…		
Utilization_C8		

4.3 System fault tags

Name	Data Type	Description
Faults	DINT	
Power_Supply_1	BOOL	1=Indicates a low voltage on power supply 1
Power_Supply_2	BOOL	1=Indicates a low voltage on power supply 2
NRing_Full	BOOL	1=Indicates that an N-Ring connection is completely broken.
NRing_Part_Low	BOOL	1=Indicates that an N-Ring connection is only broken in one direction. The lower N-Ring port is not receiving self-health frames around the N-Ring but the higher N-Ring port is.
NRing_Part_High	BOOL	1=Indicates that an N-Ring connection is only broken in one direction. The higher N-Ring port is not receiving self-health frames around the N-Ring but the lower N-Ring port is.
NRing_Multiple_Managers	BOOL	1=Indicates that more than one N-Ring Manager exists on an N-Ring.
System	BOOL	1=Indicates a system fault.
Config_Device	BOOL	1=Indicates a problem with the configuration device.

NLink	BOOL	1=Indicates that the N-Link Master or Slave encountered a problem.
Boot_Loader_Version	BOOL	1=Indicates a problem with the version of the boot loader firmware.
Port_Utilization	BOOL	1=Indicates one or more ports have exceeded a high or low bandwidth utilization limit.
Temperature	BOOL	1=Indicates the switch temperature has exceeded a high or low temperature limit.
Settings_Fault	BOOL	1=Indicates that a settings misconfiguration needs to be resolved.

4.4 CIP Tags

There are tags for each CIP object. The tags correspond to the object's attributes.

> ➢ Identity object
> ➢ TCP/IP Interface object
> ➢ Ethernet Link object
> ➢ N-TRON switch object

4.5 Identity object

Data Type: UDT_NTRON_CIP_Identity_v0

Name	Data Type	Description
Vendor_ID	INT	ODVA Vendor ID. N-Tron = 1006
Device_Type	INT	0x0C. Communications Adapter
Product_Code	INT	NT24k = 24001 NT24k-DR16 = 24002 NT24k-DR24 = 24003
Major_Revision	SINT	Major revision of the item the Identity Object represents
Minor_Revision	SINT	Minor revision of the item the Identity Object represents
Status	INT	Summary status of device
Serial_Number	DINT	Serial number of device
Product_Name	STRING	Human readable identification. Switch model number. Ex: N-TRON NT24k
Assigned_Name	UDT_NTRON_String1024	User assigned switch name.
Geographic_Location	UDT_NTRON_String1024	This is the user assigned switch location.

4.6 TCPIP object

Data Type: UDT_NTRON_CIP_TCPIP_Interface_v0

Name	Data Type	Description
Status	DINT	Interface status
Configuration_Capability	DINT	Interface capability flags
Configuration_Control	DINT	Interface control flags
Path_Size	INT	Size of Path
Object_Path_1	INT	Logical segments identifying the physical

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		link object
Object_Path_2	INT	Logical segments identifying the physical link object
IP_Address	DINT	The device's IP address.
Network_Mask	DINT	The device's network mask
Gateway_Address	DINT	Default gateway address
Name_Server_1	DINT	Primary name server
Name_Server_2	DINT	Secondary name server
Domain_Name	STRING	Default domain name
Host_Name	STRING	Host name

4.7 Ethernet Link object

Data Type: UDT_NTRON_CIP_Ethernet_Link_v0

Name	Data Type	Description
Interface_Speed	DINT	Interface speed currently in use. Speed in Mbps (e.g., 0, 10, 100, 1000, etc.)
Interface_Flags	UDT_NTRON_CIP_Interface_Flags_v0	Interface status flags
Physical_Address	SINT[6]	MAC layer address
InOctets	DINT	Octets received on the interface
InUcastPackets	DINT	Unicast packets received on the interface
InNucastPackets	DINT	Non-unicast packets received on the interface
InDiscards	DINT	Inbound packets received on the interface but discarded
InErrors	DINT	Inbound packets that contain errors (does not include In Discards)
InUnknownProtos	DINT	Inbound packets with unknown protocol
OutOctets	DINT	Octets sent on the interface
OutUcastPackets	DINT	Unicast packets sent on the interface
OutNucastPackets	DINT	Non-unicast packets sent on the interface
OutDiscards	DINT	Outbound packets discarded
OutErrors	DINT	Outbound packets that contain errors

Alignment_Errors	DINT	Frames received that are not an integral number of octets in length
FCS_Errors	DINT	Frames received that do not pass the FCS check
Single_Collisions	DINT	Successfully transmitted frames which experienced exactly one collision
Multiple_Collisions	DINT	Successfully transmitted frames which experienced more than one collision
SQE_Test_Errors	DINT	Number of times SQE test error message is generated
Deferred_Transmissions	DINT	Frames for which first transmission attempt is delayed because the medium is busy
Late_Collisions	DINT	Number of times a collision is detected later than 512 bit-times into the transmission of a packet
Excessive_Collisions	DINT	Frames for which transmission fails due to excessive collisions
MAC_Transmit_Errors	DINT	Frames for which transmission fails due to an internal MAC sub layer transmit error
Carrier_Sense_Errors	DINT	Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
Frame_Too_Long	DINT	Frames received that exceed the maximum permitted frame size
MAC_Receive_Errors	DINT	Frames for which reception on an interface fails due to an internal MAC sub layer receive error
Control_Bits	INT	0 Auto-negotiate 0 indicates 802.3 link auto-negotiation is disabled. 1 indicates auto-negotiation is enabled. If auto-negotiation is disabled, then the device shall use the settings indicated by the Forced Duplex Mode and Forced Interface Speed bits; 1 Forced Duplex Mode If the Auto-negotiate bit is 0, the Forced Duplex Mode bit indicates whether the interface shall operate in full or half duplex mode. 0 indicates the interface duplex should be half duplex. 1 indicates the interface duplex
Forced_Interface_Speed	INT	Speed at which the interface shall be forced to operate. Speed in Mbps (10, 100, 1000, etc.)
Interface_Type	SINT	0-unknown, 1-internal, 2-twisted pair, 3-optical
Interface_State	SINT	0-unknown, 1-enabled and ready, 2-disabled, 3-testing

Admin_State	SINT	1=enabled, 0=disabled
Interface_Label	STRING	Label like "A5"
Interface_Description	STRING	Something like: Port 1 - 10/100 Mbit TX Port 15 - 100 MBit FX
Interface_Utilization	SINT	Percentage of entire interface bandwidth being used (0-100)
Utilization_Alarm_Upper_Threshold	SINT	Upper percentage at which to declare a utilization alarm (0-100).
Utilization_Alarm_Lower_Threshold	SINT	Lower percentage at which to declare a utilization alarm (0-100).
Broadcast_Limit	SINT	Broadcast limiting percentage (0-100). (BPCL)
TX_Unicast_Packet_Rate	DINT	Number of TX unicast packets per second.
RX_Unicast_Packet_Rate	DINT	Number of RX unicast packets per second.
TX_Multicast_Packet_Rate	DINT	Number of TX multicast packets per second
RX_Multicast_Packet_Rate	DINT	Number of RX multicast packets per second
TX_Broadcast_Packet_Rate	DINT	Number of TX broadcast packets per second.
RX_Broadcast_Packet_Rate	DINT	Number of RX broadcast packets per second
TX_Multicast_Packets	DINT	Total number of TX multicast packets.
RX_Multicast_Packets	DINT	Total number of RX multicast packets.
TX_Broadcast_Packets	DINT	Total number of TX broadcast packets.
RX_Broadcast_Packets	DINT	Total number of RX broadcast packets.
Port_Role	DINT	Bit 0 = RSTP 1 = N-Ring 2 = N-Link Control 3 = N-Link Partner 4 = N-Link Coupler

4.8 N-TRON Switch object

Data Type: UDT_NTRON_CIP_Switch_NT24k_v1

Name	Data Type	Description
Device_Uptime	DINT	Number of seconds since device was powered up.
Port_Count	DINT	Total port count
Valid_Ports	DINT[2]	0 = Invalid port, 1 = Port exists on device Bit 0: Port 1 Bit 1: Port 2 etc.
Global_Admin_Status	DINT[2]	0 = Port disabled, 1 = Port enabled Bit n: Port n+1

Global_Link_Status	DINT[2]	0 = Link down, 1 = Link up Bit n: Port n+1
System_Faults	UDT_NTR ON_System _Faults_NT 24k_v0	See System fault tags
IGMP_Querier_Status	SINT	Query Status: 0 = Disabled, 1 = Active (manual), 2 = Active (Auto), 3 = Backup (Auto) [enabled but not active].
IGMP_Version	SINT	IGMP Version (V1, V2, V3, etc).
IGMP_Resource_Usage	SINT	Percent of maximum capacity. Takes into account the number of groups used per max groups and any other possible resource limitations.
IGMP_Active_Querier	DINT	IP of the active IGMP querier.
CPU_Usage	SINT	Percent usage
Class1_Connections	INT	Number of CIP EtherNet/IP class 1 (multicast) connections.
Class3_Connections	INT	Number of CIP EtherNet/IP class 3 (unicast) connections.
Temperature_Alarm_Upper_Threshold	INT	Upper temperature (C) at which to declare an alarm
Temperature_Alarm_Lower_Threshold	INT	Lower temperature (C) at which to declare an alarm
Contact_Status	SINT	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
Temperature_C	INT	Temperature in degrees C. Only available on devices that support temperature.
Temperature_F	INT	Temperature in degrees F. Only available on devices that support temperature.
Reset_MIB_Counts	DINT[2]	Reset port MIB counters. (1 bit per port to reset).
Device_MAC_Address	SINT[6]	MAC address of device
Device_Role	DINT	Bit mask of device roles. Bits= 0 = N-Ring Manager 1 = N-Ring Member 2 = N-Ring AutoDetect 3 = N-Link Master 4 = N-Link Slave 5 = N-Link Coupler
Config_Device_Status	SINT	0 = Not Supported, 1 = Not Present, 2 = Present
System_Configuration	DINT	Bit mask of system config. Bits= 0 = Save system configuration to flash 1 = Shutdown and reboot device
System_Firmware_Version_String	STRING	Human readable representation of firmware version string.
System_Boot_Loader_Version_String	STRING	Human readable representation of boot loader version string.
System_Fault_String	UDT_NTR ON_String1	Human readable representation of error status. May contain multiple errors. Length is contained

	024	as part of the STRINGI data type.
Power_Configuration	DINT	4 Bits per power supply. 0000 = DC Power, 0001 = AC Power, 1111 = Unknown. Power supply 1 configuration is in bits 0-3 and Power supply 2 configuration is in bits 4-7.

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5 Rockwell FactoryTalk - Faceplate Installation Instructions

N-TRON 700-Series Switch
FactoryTalk View ME/SE Faceplate Displays

Software installation prerequisites
1. FactoryTalk View Studio – ME/SE version 5 or later
2. N-TRON switch with firmware version that includes CIP support

Summary of Faceplate installation steps
1. Create shortcut to PLC
2. Add global objects to your project
3. Add local messages
4. Add images
5. Import HMI tags
6. Create faceplate display
7. Configure display startup macro
8. Configure display parameter file
9. Optionally add composite switch image to display
10. Optionally add specific switch image to display

In the instructions below, "ME" refers to FactoryTalk View ME (Machine Edition) and
"SE" refers to FactoryTalk View SE (Site Edition).

5.1 Configuration of FactoryTalk View Faceplate Displays

Extract all files from the zip file to your desktop or some other folder.

Start with an existing FactoryTalk View ME/SE application.

1. Configure a shortcut to the PLC that is running the NTRON AOI. Double click
Communications Setup.
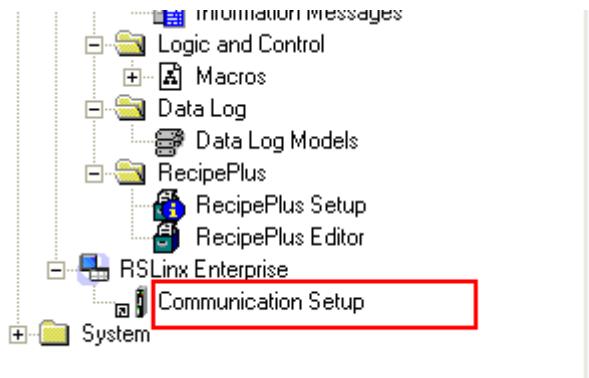
In the screenshot following, the shortcut is named PLC.

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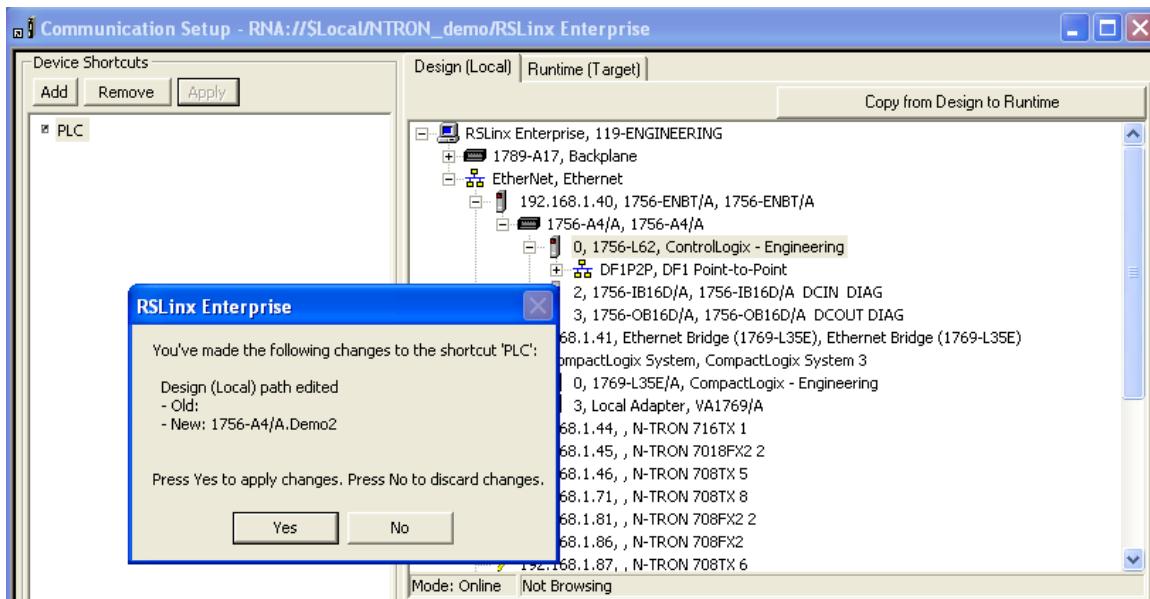
Click the "Yes" button and if ME, click the "Copy from Design to Runtime" button.

2. Import graphics
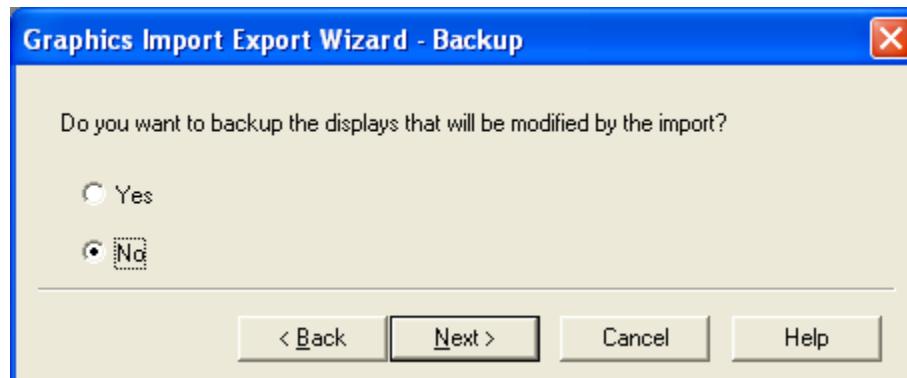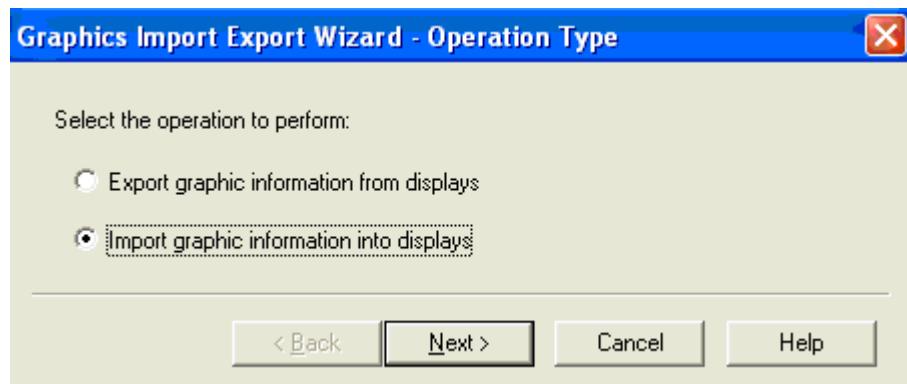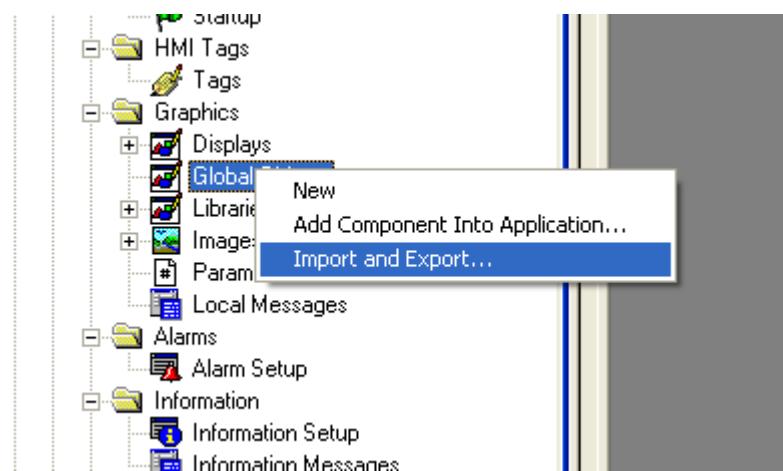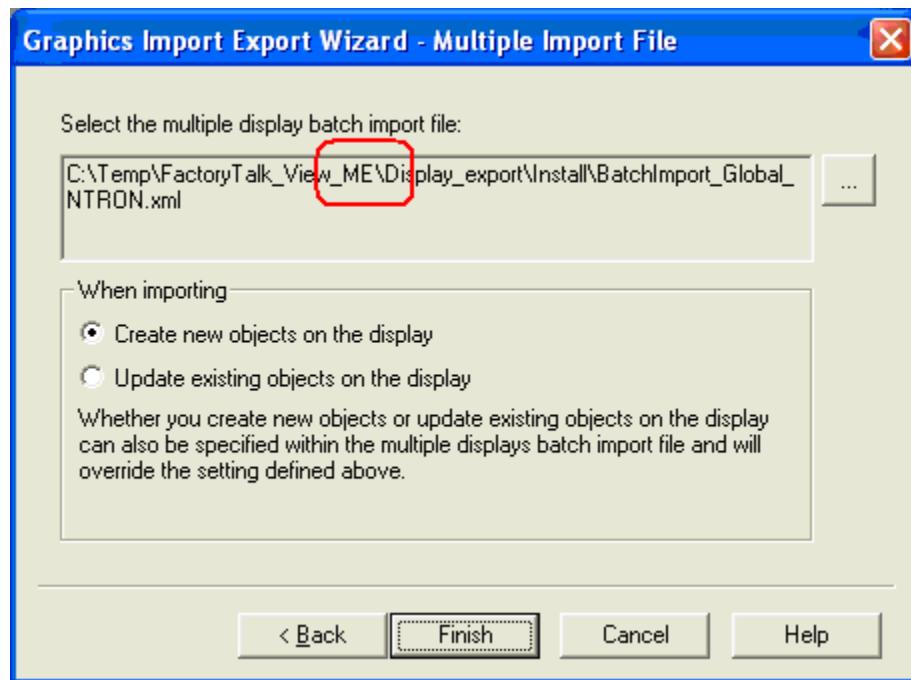
For SE, use the FactoryTalk_View_SE folder in the above dialog.

These global objects should appear in the Explorer window:
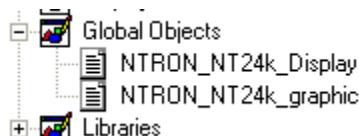
3. Import local messages
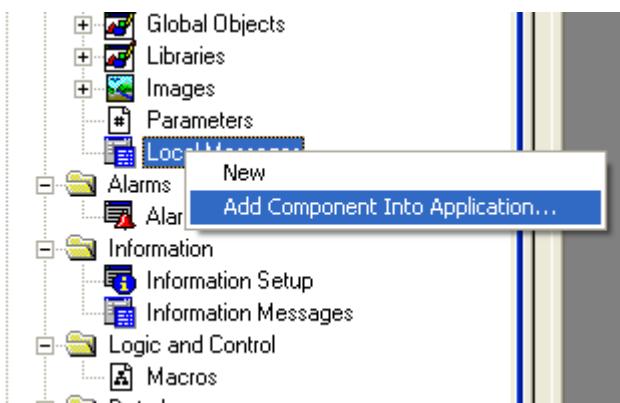
Select the folder (FactoryTalk_View_ME\Display_export\Install\local) containing the local message files (.loc). Import all NTRON*.loc files. The Explorer window should show these files:
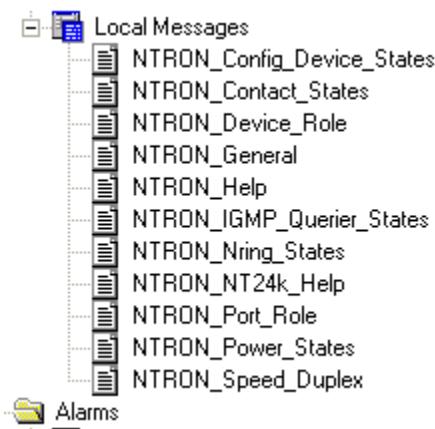
4. Import images.
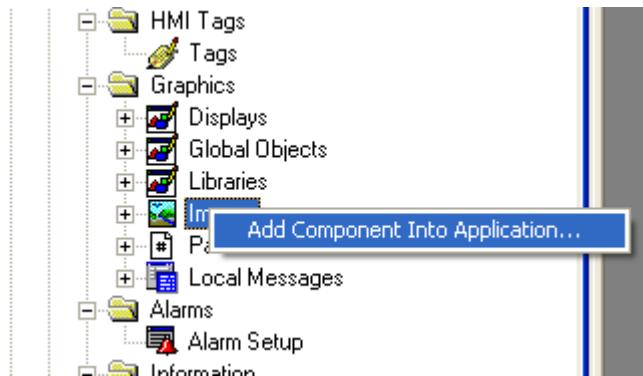
Select the folder (FactoryTalk_View_ME\Display_export\Install\images) containing the image files (.bmp). Import all NTRON*.bmp files. The Explorer window should show several new files:

```
    Home_default
    NTRON_alarm
    NTRON_alarm_bw
    NTRON_alarm_red
    NTRON_diagnostics
    NTRON_exit
    NTRON_home
    NTRON_Question_Mark
    NTRON_settings
```
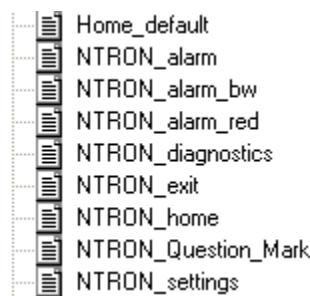
5. Import tags using the Tag Import and Export Wizard. Select the NTRON-Tags.CSV to import (FactoryTalk_View_ME\Display_export\Install\tags). The result should be these tags:

	Tag Name	Type	Description
1	NTRON_Help	Digital	
2	NTRON_Settings_Selection	Analog	
3	NTRON_Trend_Selection	Analog	
4			

6. To access the faceplate displays, create a display using the global object NTRON_NT24k_Display. (File > New > Display. Select all objects in the NTRON_NT24k_Display global object and paste them into the new display. Save the new display.)

Configure a macro for opening your display. Here is the ME form for this example:

NTRON_Open_228 - /NTRON_demo/ (Macros)

Form: <Tag> = <Expression>

	Tag	Tag	Expression	Exprn
1	{[PLC]N228Params.Control.HMI[0].Display_Mode}	•••	1	•••
2		•••		•••
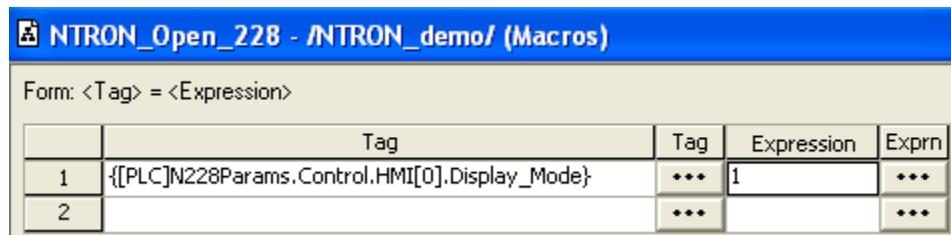
Tag from screenshot: {[PLC]N228Params.Control.HMI[0].Display_Mode}

Here is the SE form:
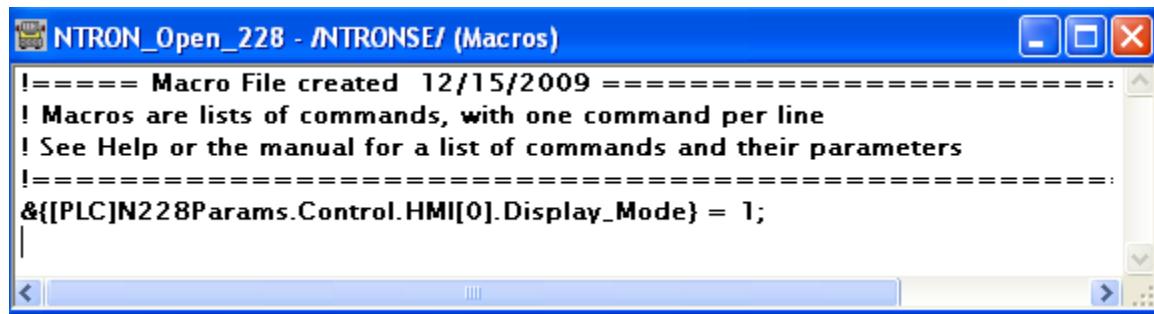
Tag from screenshot: &{[PLC]N228Params.Control.HMI[0].Display_Mode} = 1;

In the macro definition (and later in the parameter file), the shortcut "PLC" was created earlier. The other important piece is "N228Params", which is the name of the Switch_Parameters tag created for the NTRON_SWITCH AOI in your RSLogix project. Example:
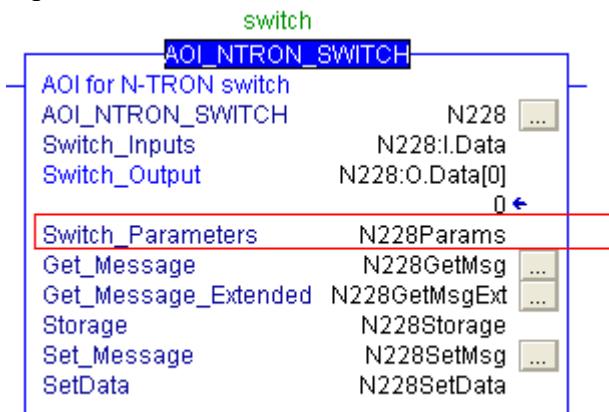
In the Display Settings for the NTRON_NT24k_Display (open the NTRON_NT24k_Display display, Edit > Display Settings) click the Behavior panel and assign the newly created macro as the startup macro.
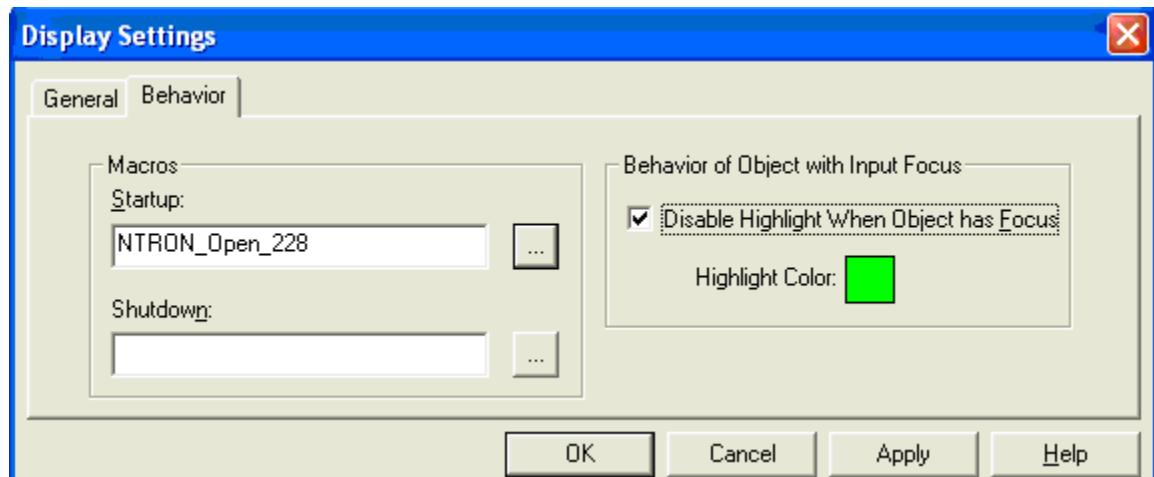
8. Click the General tab and change Display Type and Size. Here is the ME form:
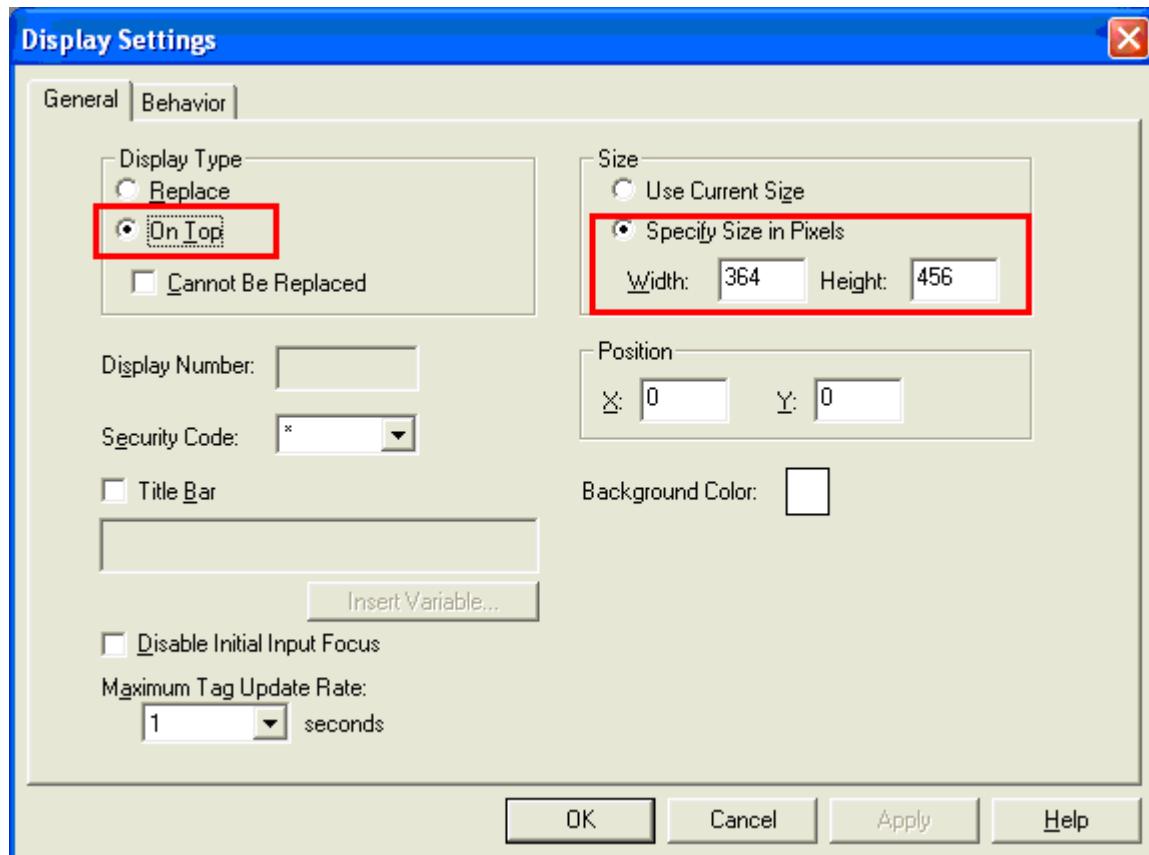
Here is the SE form:
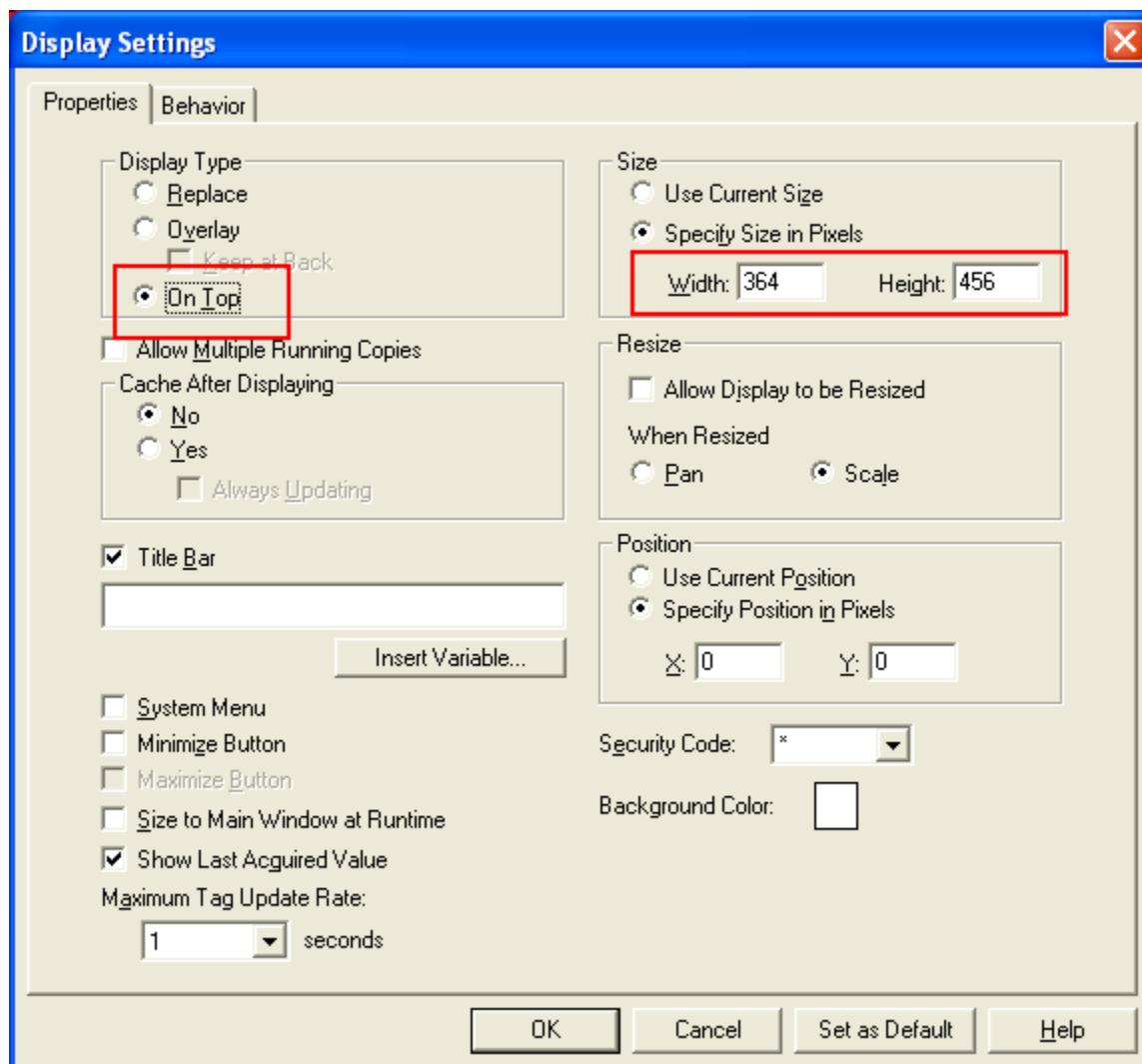
On the display where you wish to show the faceplate, create a Goto Display button.
Create a parameter file that will be associated with the button.

Substitute your shortcut for "PLC" and the name of your Switch_Parameters for N228Params, in the parameter file.

Assign a display and parameter file to the Goto Display button. Here is the ME form:
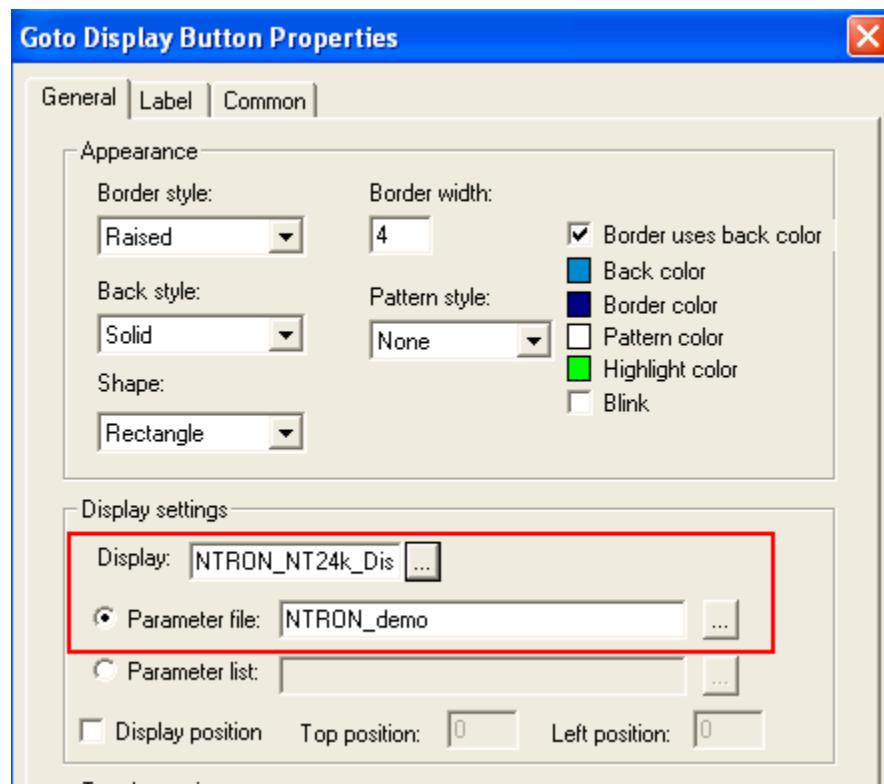
Here is the SE form:
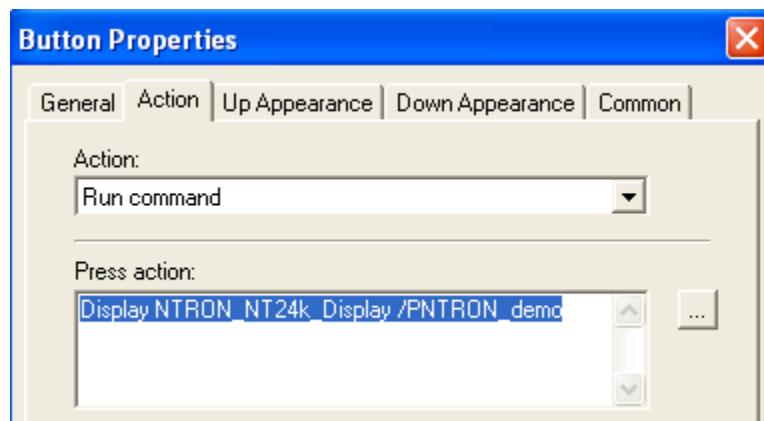
You can also display an image of an NTRON switch using the global object NTRON_NT24k_graphic. When used, define Global Object Parameter #1 as follows:

The NTRON_NT24k_graphic global object is a composite of several N-TRON switches. Due to the number of switches, and the tags used for each switch, you may run into the limit for maximum tags allowed on a display.

To work around this limitation, use individual global objects for each switch. These are imported by using the BatchImport_Global_NTRON_Switches.xml import file. The global object names contain the switch name, such as NTRON_NT24k_DR16. Setup Global Object Parameter #1 as described for the NTRON_NT24k_graphic object.

For more information on the displays, including screenshots, see the Faceplate Quick Reference.

FactoryTalk View SE Client setup:

FactoryTalk View SE Client Window Properties   ✕

Specify the properties of the FactoryTalk View SE Client window.

☑ Show title bar

Title bar text: N-TRON Faceplates

☑ Show system menu and close button

☑ Show Min/Max buttons

☐ Maximize window

☑ Show Diagnostics List

☑ Allow undocking of Diagnostics List

☐ Disable switch to other applications

Help	About...	Cancel	< Back	Next >
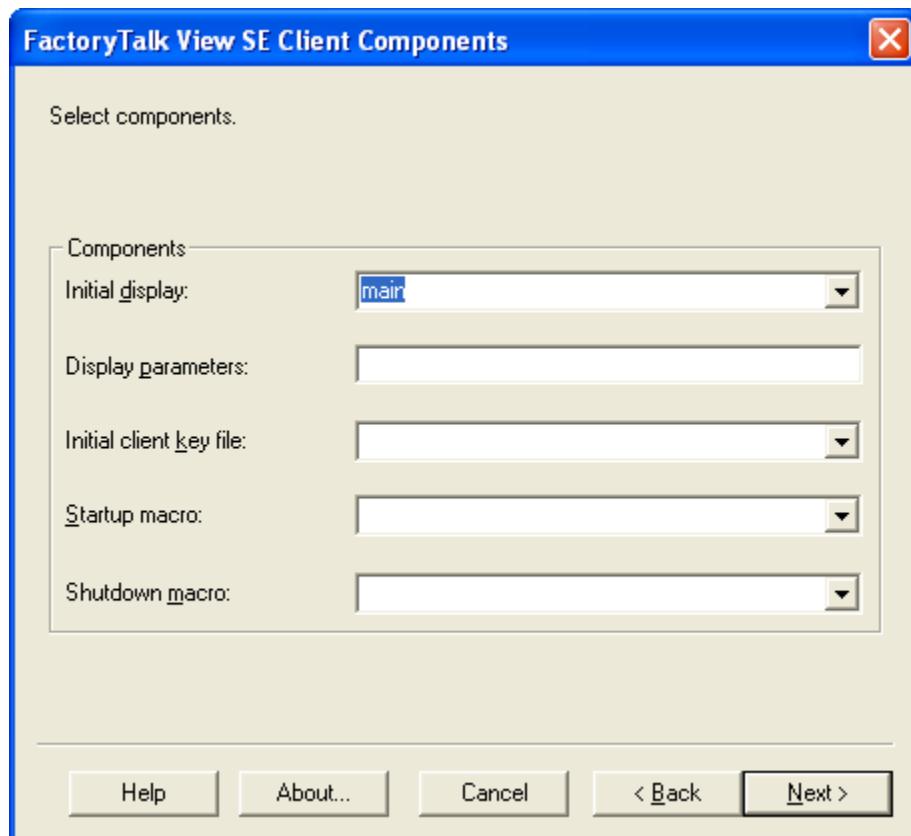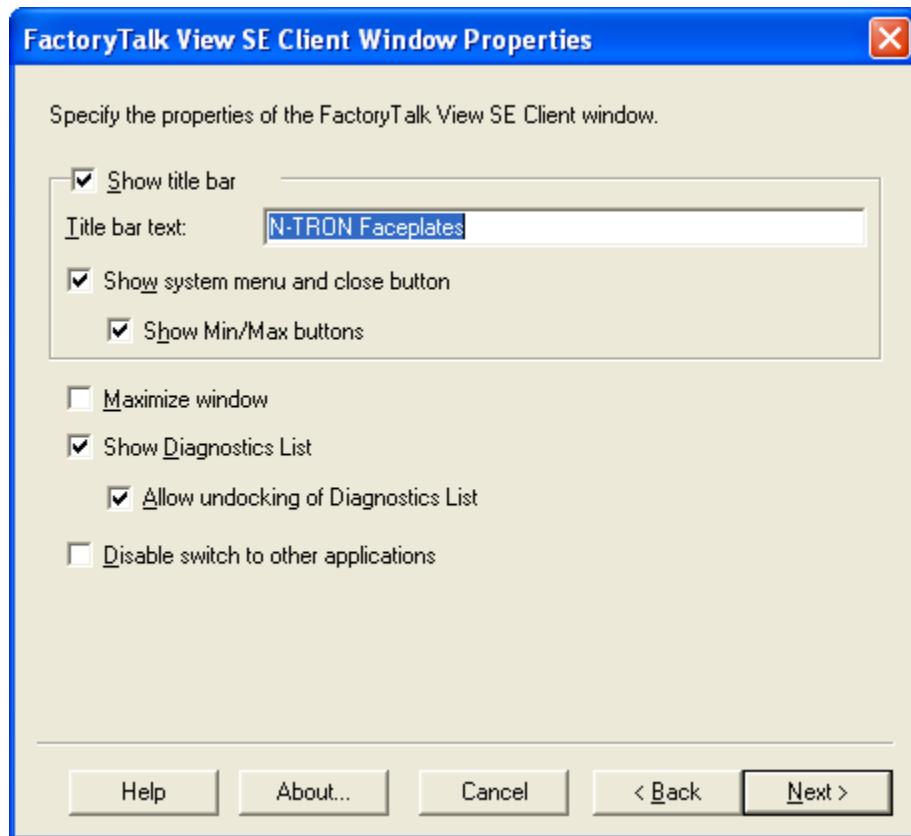
5.2 Sample Project

Refer to the ME or SE sample project archive named NTRON_demo.apa.

If you have any suggestions for improving the faceplates or the installation instructions, please send them to email with subject "FactoryTalk Faceplates".

6 Rockwell FactoryTalk - Faceplate quick reference guide

6.1 Introduction

The Faceplates consists of several displays: Home, Diagnostics, Settings, and Alarm. Click the buttons at the top of the screen to navigate between the displays. The "?" button is used to toggle the display of help text, and the "X" button is used to exit the Faceplates.


The caption at the top includes the switch product name and the user assigned switch name, separated by a colon.
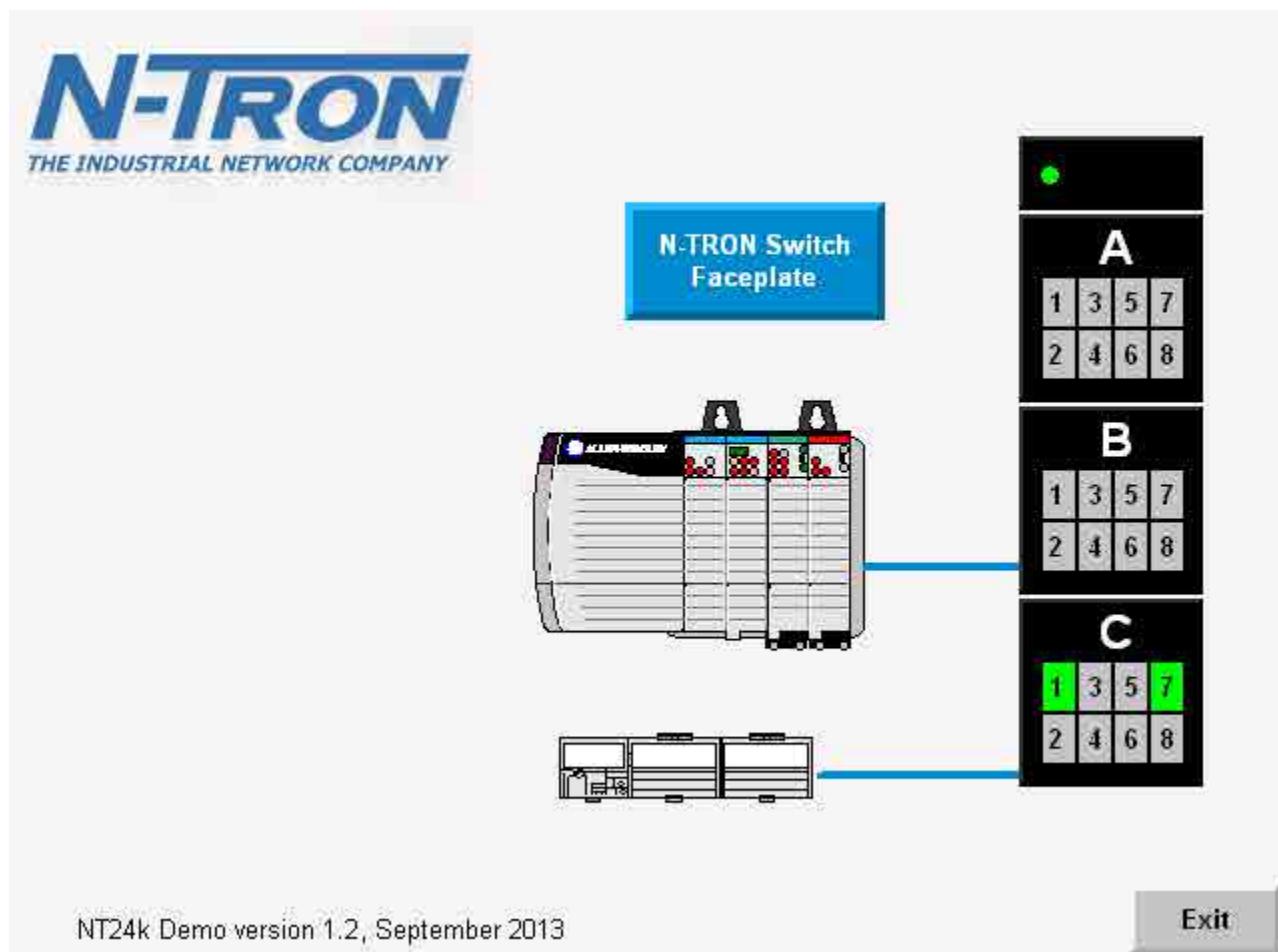
6.2 Home display

This home display shows general switch information. The trend shows CPU utilization.
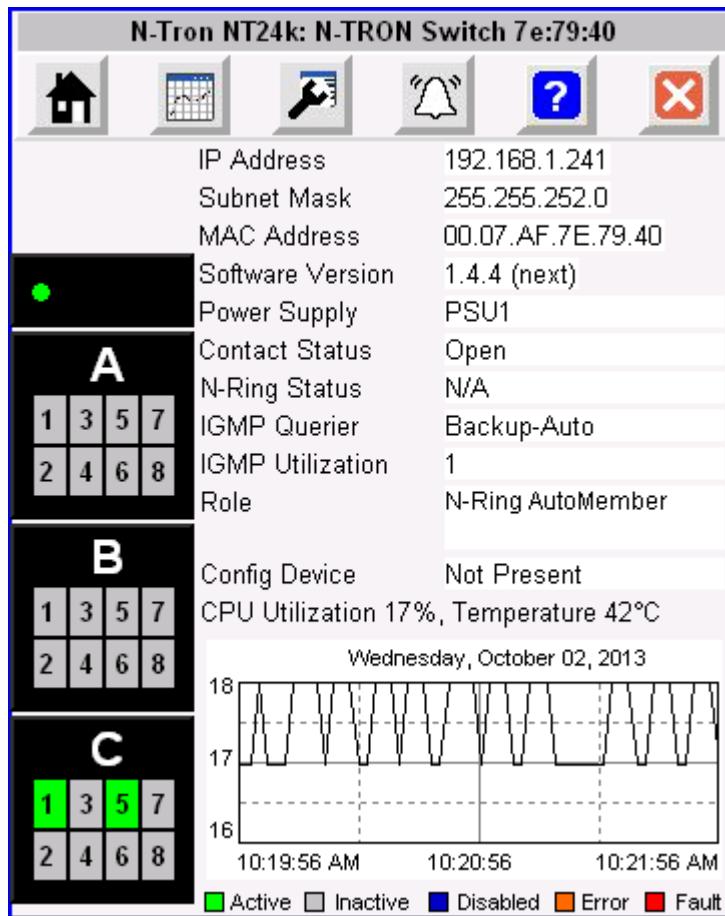
Some fields show simple values, such as IP Address. Others, such as Device Role, show values that depend on the switch configuration. Fields that do not apply to a specific switch model will be hidden.

The following table describes fields and values.

Field	Values	Description
IP Address	Like 192.168.1.201	Switch IP address
Subnet Mask	Like 255.255.255.0	Switch subnet mask
MAC Address	Like 00:07:AF:FE:8F:A0	MAC address of switch
Software Version	Like 3.0.2	Software version of switch
Power Supply	PSU1 PSU2 PSU1 and PSU2 Unknown AC/DC Power	PSU1 – Power Supply 1 PSU2 – Power Supply 2
Contact Status	Not Supported	The status of the contact on the

	Open Closed	switch.
N-Ring Status	Fault Partial-Low Partial-High Multiple-Managers OK N/A (if N-Ring auto-member, or N-Ring disabled) Unknown (if N-Ring member)	The N-Ring status, if the switch is configured as an N-Ring manager.
IGMP Querier	Disabled Active-Manual Active-Auto Backup-Auto Unknown	Internet Group Management Protocol Querier status
IGMP Utilization	0-100 percent	Internet Group Management Protocol Utilization
Config Device	Not Supported Not Present Present Unknown	This field is displayed for switches that support a configuration device.
Role	N-Ring Manager N-Ring Member N-Ring AutoMember N-Link Master N-Ring Mem, N-Link Master N-Ring Auto, N-Link Master N-Link Slave N-Ring Mem, N-Link Slave N-Ring Auto, N-Link Slave N-Link Coupler N-Ring Mem, N-Link Coupler N-Ring Auto, N-Link Coupler Unknown	The role of the switch, which is based on the switch configuration.
CPU Utilization	0-100 percent	CPU utilization percentage
CPU Trend	0-100 percent	Trend of CPU utilization

On the switch image, the color of each port changes based on the port state.

Port Color	Port State
Active	The port is active
Inactive	The port is inactive
Disabled	The port is administratively disabled
Error	A port utilization limit, high or low, has been exceeded

The LED at the top of the switch graphic will be green if there are no faults, red if a fault has occurred. You can view faults on the alarms display.

6.3 Diagnostics display

The diagnostics display shows information for a selected switch port. Use the buttons at the bottom to select a switch port and use the buttons at the left to select a port variable to trend. The highlighted variable is trended at the bottom.
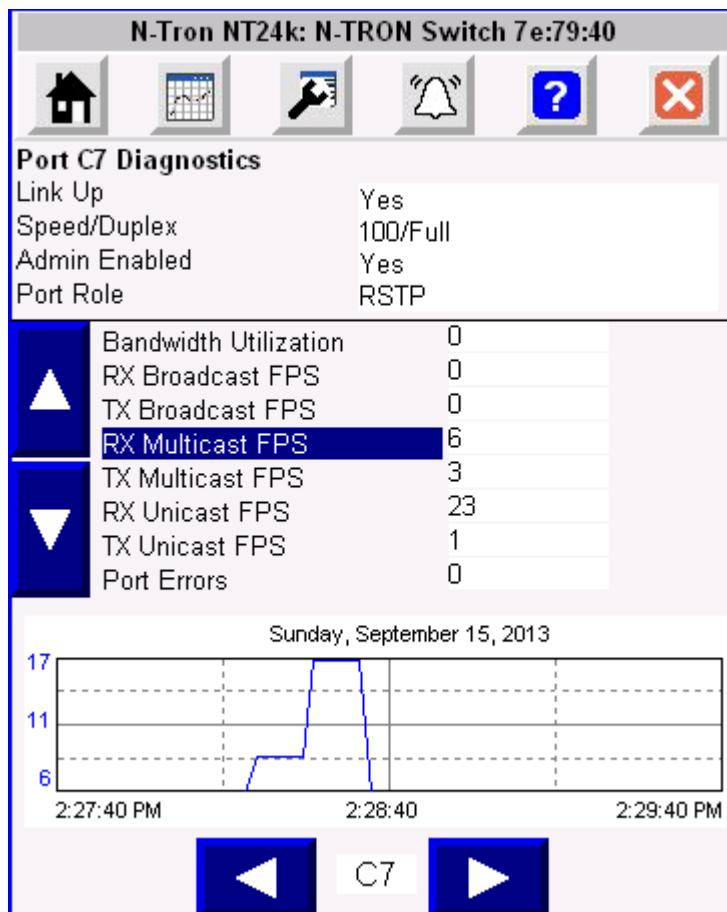
The following table describes fields and values.

| Field	Values	Description
Link Up	Yes No	Current link state
Speed/Duplex	10/Full 100/Full 1000/Full 10/Half 100/Half Unknown	This configurable field displays the current speed and mode of the port
Admin Enabled	Yes No	This configurable field displays the existing status of the port whether it is Enabled/Disabled.

Port Role	RSTP N-Ring N-Link Control N-Link Partner RSTP, N-Link Partner N-Ring, N-Link Partner N-Link Coupler RSTP, N-Link Coupler	The role of the port, which is based on the switch configuration. Some combinations are possible. For more details, see the user manual for the NT24k switch family.
Bandwidth Utilization	0-100 percent	Bandwidth utilization displayed as a percentage
RX Broadcast FPS		The frames per second rate of received broadcast frames.
TX Broadcast FPS		The frames per second rate of transmitted broadcast frames.
RX Multicast FPS		The frames per second rate of received multicast frames
TX Multicast FPS		The frames per second rate of transmitted multicast frames
RX Unicast FPS		The frames per second rate of received unicast frames
TX Unicast FPS		The frames per second rate of transmitted unicast frames
Port Errors		The sum of alignment errors, FCS errors, SQE Test errors, excessive collisions, MAC transmit errors, carrier sense errors, frame too long, and MAC receive errors.

6.4 Settings display

The settings display allows some switch port related settings to be changed.
Use the buttons at the bottom to select a switch port and use the buttons at the left to
select a port setting to change. Use the wide up/down buttons toward the bottom to select
a value, and the Enter button to accept the change.
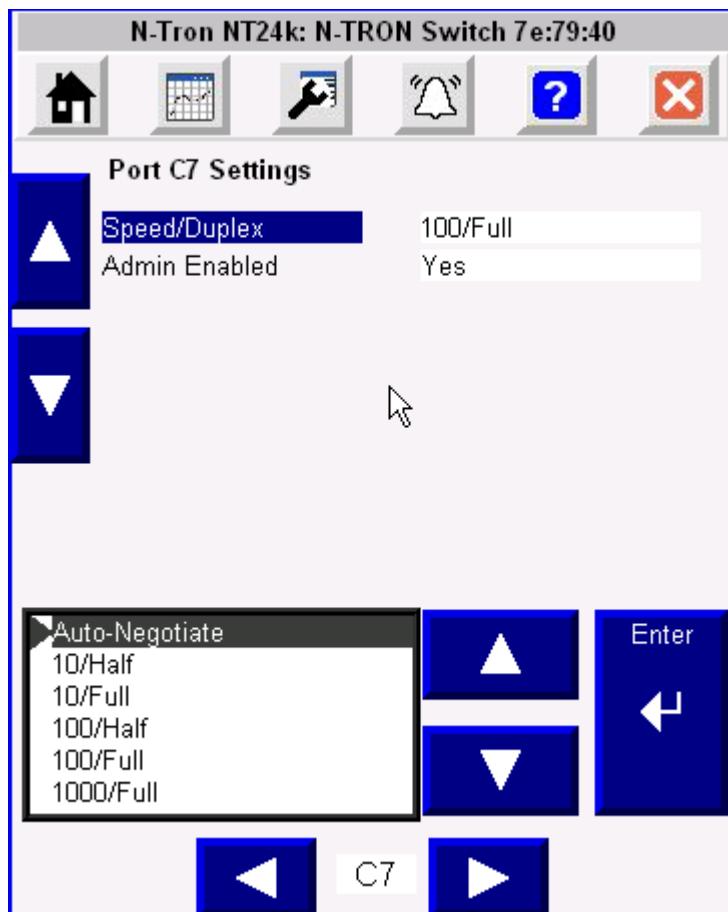
The following table describes fields and values.

Field	Value	Description
Speed/Duplex	10/Full 100/Full 1000/Full 10/Half 100/Half Unknown	This configurable field displays the current speed and mode of the port
Admin Enabled	Yes No	This configurable field displays the existing status of the port whether it is Enabled/Disabled.

6.5 Alarm display

The alarm display shows the status of several alarms. Alarms with a grey background and an "N/A" suffix do not apply for the switch type, or for the current configuration of the switch.
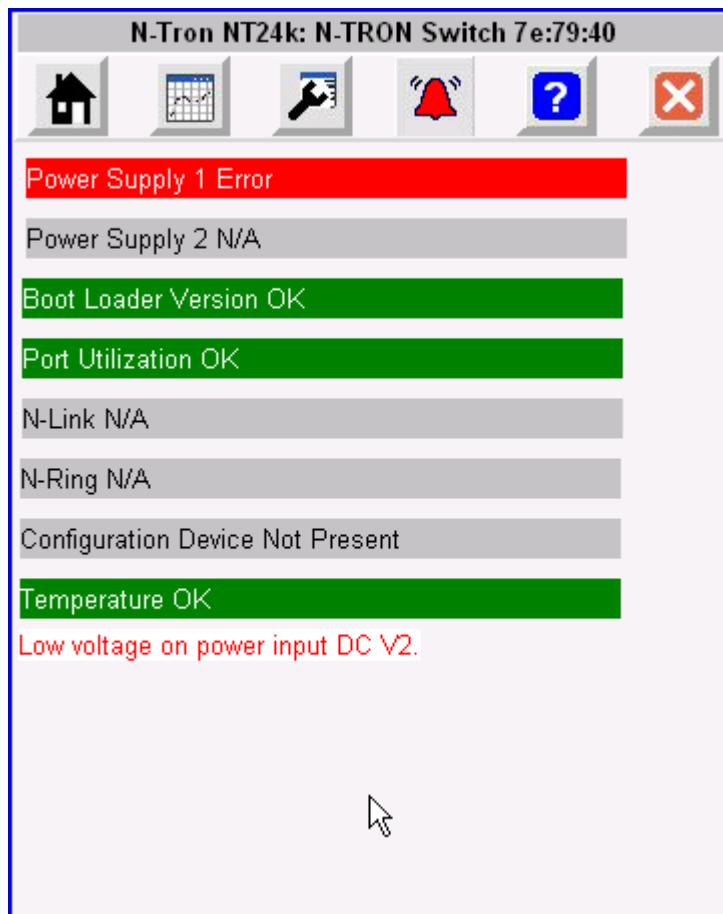
Values ending with "OK" will be green, with "Error" will be red, and with "N/A" will be gray. Fields that do not apply to a specific switch model will be hidden.

The following table describes fields and values.

Field	Values	Description
Power Supply 1	Power Supply 1 OK Power Supply 1 Error	PSU1
Power Supply 2	Power Supply 2 OK Power Supply 2 Error	PSU2
Boot Loader Version	Boot Loader Version OK Boot Loader Version Error	
Port Utilization	Port Utilization OK Port Utilization Error	Shows error if utilization limits on any port is exceeded

N-Link	N-Link OK N-Link Error N-Link N/A	Shows N/A if not configured for N-Link
N-Ring	N-Ring Error (Redundancy Lost) N-Ring Error (Partial Low) N-Ring Error (Partial High) N-Ring Error (Multiple Managers) N-Ring Error (Redundancy Lost, Mult Mgrs) N-Ring Error (Partial Low, Mult Mgrs) N-Ring Error (Partial High, Mult Mgrs) N-Ring OK N-Ring N/A	Shows N/A if not configured as an N-Ring manager
Configuration Device	Configuration Device OK Configuration Device Error Configuration Device N/A	This field is displayed if the switch supports a configuration device
Temperature	Temperature OK Temperature Error Temperature N/A	This field is displayed if the switch supports a temperature sensor

The system fault string is shown at the bottom of the display

6.6 Error Messages

There are a few messages that appear on the faceplate near the top when certain errors are detected.
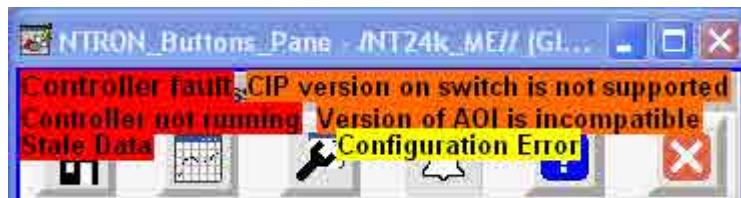
The table below describes the messages.

Background Color	Message	Description
Red	Controller fault	The controller[1] is in the "Faulted" mode.
Red	Controller not running	The controller[1] is not in the "Run" or "Remote Run" mode.
Red	Stale Data	The controller[1] has stopped receiving data updates from the switch[2].
Orange	CIP version on switch is not supported	The CIP version on the switch[2] is not supported by the add-on instruction on the controller[1].
Orange	Version of AOI is incompatible	The add-on instruction on the controller[1] does not support the switch[2].
Yellow	Configuration Error	The product code for the switch[2] is invalid or has not been read.

[1] *Controller refers to the third replacement text (example: #3=PLC) of the parameter file associated with the display.*

[2] *Switch refers to the switch associated with the first replacement text (example: #1=[PLC]N228Params) of the parameter file associated with the display.*

7 Support

Contact Information:

8 References

[1] The CIP Networks Library, Volume 1: Common Industrial Protocol (CIP™), Edition 3.5, Publication Number: PUB00001, Open DeviceNet Vendor Association, Inc., 4220 Varsity Drive, Suite A, Ann Arbor, MI 48108-5006 USA

[2] The CIP Networks Library, Volume 2: EtherNet/IP Adaptation of CIP, Edition 1.6, Publication Number: PUB00002, Open DeviceNet Vendor Association, Inc., 4220 Varsity Drive, Suite A, Ann Arbor, MI 48108-5006 USA

9 Revisions

Revision	Description
July 2013	Initial version with support for switches in the NT24k family.
August 23, 2013	Added missing documentation for the Power Configuration attribute of the NTron object.
October 2013	Added faceplate installation instructions and quick reference guide.
March 2014	Added a description of the faceplate error messages.